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Wild Life in the Suburbs

Furred and feathered creatures are learning to live with man and like it

By ANDREW S. WING

Illustrated by R. Bruce Horsfall

NOT long ago a suburban neighbor sent me this telephone S.O.S.: "Have you got a gun?" she urgently implored. "If so, please hurry over—a weasel's killing pigeons in our barn!"

Dashing over with a revolver, I found her holding her ears while the gardener fired several blasts with an ancient fowling piece. The weasel slipped out of sight, to be bagged later, but not until he had polished off the last pigeon. When I recently asked my friend if she had seen any more weasels, she said no, but that her dachshund had treed two 'possums, one of which was captured alive.

"And what would you do if you found two large blacksnakes in your garden?" she asked.

"I'd leave them alone," I replied. "They are harmless, and they kill rats and mice."

"But I don't like blacksnakes," she replied with a wry face. There was obviously no answer to that.

But since that first weasel episode, I have seen one in our own backyard; pheasants have neatly solved the surplus problem in our kitchen garden; and a wild deer has been seen crossing the street not far from our house. Our little Connecticut surburban town seems to be going back to Nature in a big way.

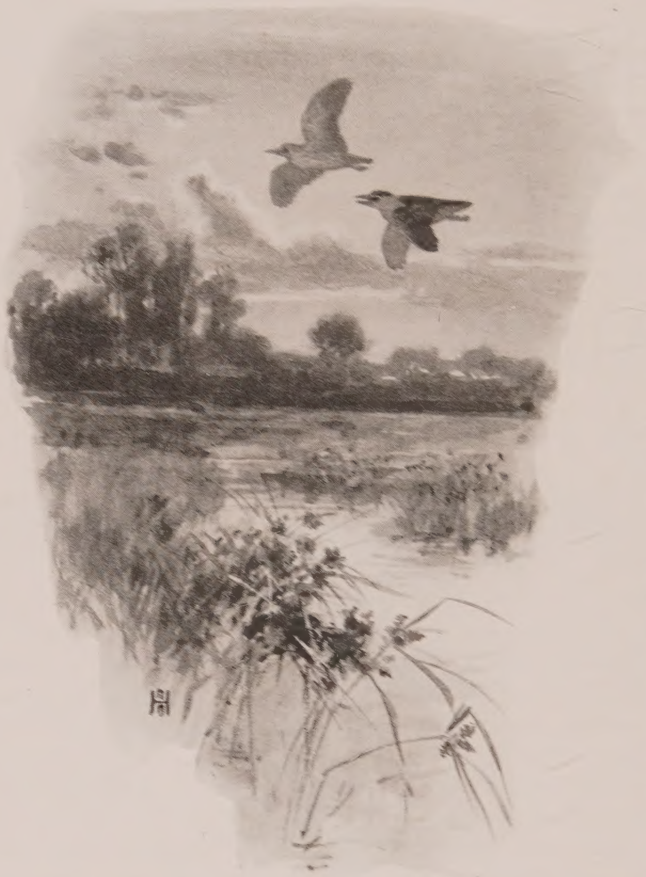
Before going further I should make it clear that we live in no rural retreat, but in a suburb of New York that is exactly 30.3 miles by rail from Grand Central Station. Our portion of the Town of Greenwich lies between the rocky shores of Long Island Sound and a stretch of the busy Boston Post Road, which some wag grimly dubbed "Death Valley". Our own house is between the New Haven mainline and the harbor, and we are cut off from the real rural hinterland by both railroad and an express highway. We have a few sizeable tracts of woodland. But we are, alas, definitely within the Greater New York zone. We have churches, schools, garages, stores, and enough local traffic so that blinker lights and speed warnings are necessary. Moreover, we have an ample population of dogs, many cats, to say nothing of boys armed with small-bore rifles and air guns.

We have no bird sanctuaries, no organized movement to protect wild life. It is still legal to hunt ducks, geese, pheasants and squirrels during the open seasons. It is hard to account for such an abundance of wild life in such close association with man, unless it can be charged to a change in habits.

In the adjacent back country of Westchester County, New York, and Fairfield County, Connecticut, one expects to see wild things and often does. Ten or fifteen miles to the north are wilderness areas that, because of their rugged, rocky nature, have never been put under the plow, or even completely cleared. There ruffed grouse and woodcock can be seen, if you know where to look; deer are plentiful; red foxes roam; and rattlesnakes and copperheads rear ugly heads. But that is in the back country. We are in the village and definitely suburban. We wonder at the visitations of Nature with which we are blessed, and are grateful for most of them. But they still remain somewhat of a mystery to us.

In eighteen years of living in these parts, I have given this matter a good deal of thought, and it seems to me that one might begin by breaking our wild friends down into rather rough groups: 1, Those that derive at least part of their subsistence from man. 2, Those that stay around in spite of man. In the first group I would place the rodents, such as rabbits, rats and mice; the scavengers such as the skunks; and the plunderers such as the pheasants. In the second group belong the wilder birds, the deer, foxes, squirrels, chipmunks, and the really rare creature that is numbered among our neighbors, the mink.

To attempt such a breakdown, one must be rather arbitrary. We know that all of these creatures, with the exception of the rat, existed before the white man came, and that they get along perfectly well in wilderness areas. But in the first group, many of the beasts and birds have long since learned that it is easier to live with man than to live alone—and actually seem to enjoy contact with mankind. Even in the second group there seems to be quite a tendency to drop rugged individualism in favor of at least a partial dependence on man. Wild birds come around in winter, especially after deep snows, for handouts; deer graze in meadows and are destructive to gardens and young orchards; foxes raid hen yards; while squirrels quickly learn to prefer a diet of peanuts and crackerjack to hickory nuts and acorns.



". . . THE CURT CROAKING OF THE NIGHT HERONS AS THEY FLY OVER REMINDS US THAT ONE OF THE LARGEST HERONRIES IN THE STATE IS NEAR BY."

When, eighteen years ago, we first came to these parts to live, we liked the rural feeling, but were not aware of any noticeable amount of wild life except the shore and water birds. But when my wife surprised the milk man playing tag with a beautiful star-black woods pussy early one morning on the kitchen porch, we became abundantly aware that we were living in what one might call a skunk heaven. Since then we have been regularly and emphatically reminded of this visitor by his nightly calls, although we seldom see one alive. A few years ago our highways were literally plastered with skunk remains, victims of night-speeding motorists. Then, for a time the skunk cycle seemed to decline a little, and other cycles came up. But the skunks are always with us. In a dozen years our shepherd dog has learned not to grapple with a skunk, but he still enjoys a skirmish with them, even if we don't. Some years ago when we lived in an old house by the river, we were visited nightly by a skunk with such habits that he could have been used as an alarm clock. In winter he passed by at exactly six o'clock every morning. It was dark, of course, and I never saw him, but I frequently clocked him, and he was never more than five minutes off schedule. He made his rounds as regularly as the milk man and his timing was more accurate than the railroad's.

Gray squirrels and chipmunks we have always with us. Red squirrels, for some reason or other, stay mostly in the back country, although they seem to have little fear of either man or larger animals. Squirrel chasing is a game with most dogs; they never fail to give chase, and the squirrels, sure of their superior speed, seem to enjoy the sprint to the nearest tree. A neighbor was so bothered with squirrels gnawing holes in her roof that she got permission for her gardener to shoot them. He goes banging around and no doubt kills a few. In another part of the town a game warden, who had been tipped off, found a lad with fifty squirrel skins tacked on the garage door—all killed out of season. He was fined a dollar for each skin. But in spite of all the legal and illegal sniping the squirrel population remains practically constant.

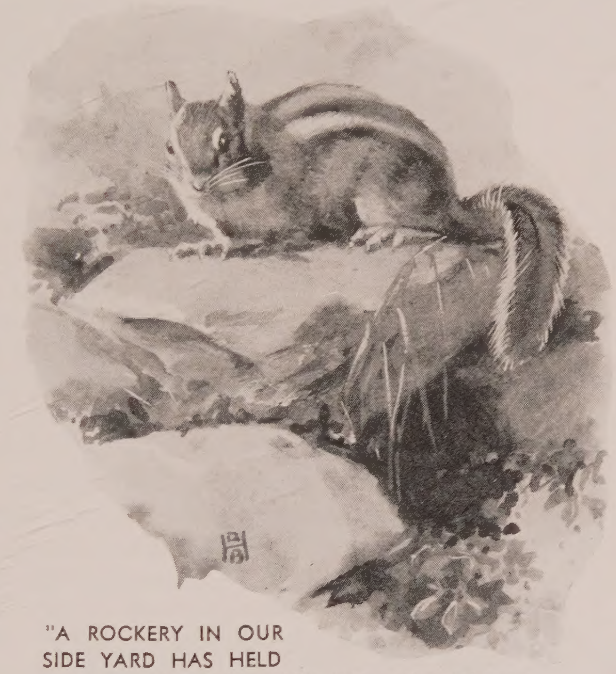
There is probably some relationship between the chipmunks and the stone walls in which this region abounds. The chipmunk population is never large, but it is steady, and the coy little creatures add real zest to our outdoor hours. When the distinguished British lecturer W. Arnold-Forster made his first visit to this country, one of the things he wanted most to see was a chipmunk, and friends in this community had the pleasure of showing him one.

A rockery in our side yard has been occupied by a chipmunk family for some years. They are shy but not fearful of man and so far as I know have no vices. Their habit of watching you from a perch on a wall or fence is always a temptation to linger just to see how long it would take to sit a chipmunk out.

When last summer I saw from a window two small furry creatures locked in deadly embrace in this corner of the yard, I dashed out fearing at first that it was two chipmunks fighting. When I came closer I saw that it was a weasel killing a rat. The weasel dropped the dying rat, which was slightly larger than it was, and ran to a safe perch on a wall, but when we withdrew it immediately ran back to its prey and dragged it to a hole in the wall. Weasels are like that; when they get a taste of blood they seem to have no fear of man. As this corner of the yard was the home of the chipmunks, I feared for their safety, but they reappeared in time, so apparently they had a retreat safe from any hungry and active weasels.

Not having seen or heard of weasels locally for a dozen years, I wondered why they suddenly became relatively common. One theory is that their natural food supply has increased. This seems a plausible explanation. For several years we were plagued with field mice, which hid in the long grass of vacant lots, and, during the winters of heavy snowfall, did a great deal of damage by girdling young trees, rose bushes, even euonymous vines and azaleas. Many tulip and narcissus plantings were completely annihilated. Moles got the blame for the bulb damage, but since moles are insectivorous, it was undoubtedly field mice using the mole runs. Why the great increase in field mice? Probably because the heavy snows shielded them from hawks, owls, cats and other natural enemies. So the weasels appeared on the scene, from just where I'm sure I don't know, to restore Nature's balance to the rodent world. At least this explanation seems reasonable, and I believe it has some scientific backing.

Just why the opossums showed up is another puzzling question. They are not dependent on man or other animals. True, they are scavengers and that may be the reason. For although most of us hire some one to remove our garbage and refuse, there may be enough people in the town addicted to the practice of burying their garbage to make suburban life attractive to opossums and skunks. We frequently see opossums at night, usually at certain points where they cross the side roads from one wooded lot to another. They are stupid, sluggish creatures and make no attempt to scurry out of sight as the quicker, craftier creatures do.


"A ROCKERY IN OUR SIDE YARD HAS HELD A FAMILY OF CHIPMUNKS FOR SOME YEARS."

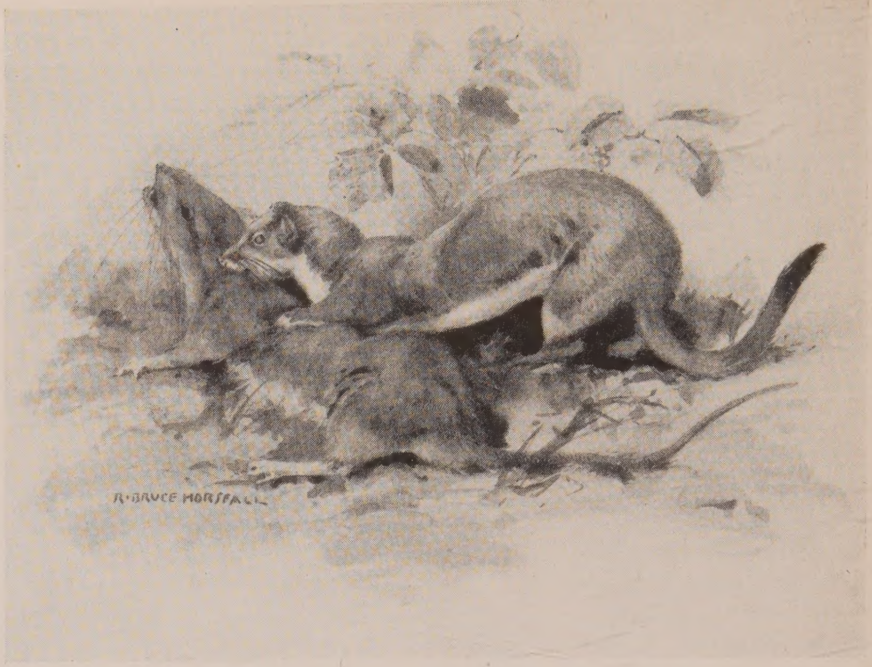
I have long suspected that there are raccoons about too, as there are plenty of clams and other shellfish on which they could feed at low tide. Old timers tell me they were formerly quite common. But these sly, intelligent little beasts are not often seen unless treed at night by a dog.

Why the cottontail rabbits showed up in such hordes this season is also puzzling. Probably the rabbit population had been steadily increasing for several years without our noticing it. There may be some relationship between the field mouse curve and the number of rabbits that survive the hawks, owls, cats and weasels. At any rate, early last spring our garden became alive with young bunnies. They gobbled off an early planting of string beans and began making serious inroads on other garden "sass." Patiently I planted more beans and when their leaves opened sprinkled them with an insecticide with an unpleasant taste but not injurious to red-blooded animals. I didn't really want to kill the rabbits, but thought that their bean biting should be curbed. When that didn't faze them and the new planting of beans disappeared down hungry rabbit gullets, I became a bit peeved. If the choice lay between beans and bunnies, I'd take the beans. So I replanted the beans and this time sprinkled their leaves and the young cabbages and broccoli plants with arsenate of lead. That seemed to work. At least enough plants survived to give us a few pickings of beans before the bean beetles gobbled them up. Moreover, there was no perceptible falling off in the rabbit population. Perhaps they switched to other fare, or maybe the heavy rains washed off the poison before the rabbits ate enough to harm them. I've heard since that the thing to do is to plant pyrethrum near the plants you want to save. Rabbits, it seems, adore pyrethrum—the common painted daisies of grandmother's garden; or, a chicken wire fence will do the trick.

Rabbits, of course, make a monkey of the average dog when it comes to a chase. Our old shepherd, a Scotty, and a Chow chased the rabbits from the garden with ferocious glee, but never got near enough to one to make it exciting. Tall weeds and a few thorny bushes make impregnable rabbit refuges.

About the only inroads of importance that are made on our wild life are those made by automobiles. Everyone who has travelled by car in recent years has noticed this. In addition to skunks, cars take a heavy toll of almost all wild things including squirrels, birds, rabbits, mice, snakes, toads, turtles, and even deer. I recall stretches of road in West Texas that were literally plastered with jackrabbits, victims of hit-and-run night drivers. Jacks are a menace to cattle ranges and no one mourns for them when they are killed. Here I feel sorry for the creatures that are run over. But while it may seem cruel, I'm sure that we would suffer from overpopulation of some of the smaller animals if it were not for the number killed on the highways. Thus the automobile may be playing a vital though gruesome part in maintaining the balance between beast and man.

Ring-neck pheasants are the aristocrats of our wild visitors. I say wild cautiously, for our pheasants become almost as tame as chickens. These hardy creatures haunt the lowlands that border the shore. When in winter we scatter scratch feed on the terrace, they come morning and evening to pick it up, sometimes eight or ten together. If the dog disturbs them they go sailing off with pro-



". . . TWO SMALL FURRY CREATURES LOCKED IN DEADLY EMBRACE IN THE CORNER OF THE YARD"

testing squawks. They know that they are safe with us but create the illusion of wildness by slipping up with furtive looks to one side and another, and by glancing around suspiciously after each bite. If someone could breed a strain of pheasants that had pleasanter voices, he would make a real contribution. The cocks are annoying, when, during the spring mating season, they awaken us at crack of dawn with strident calls under our window. In midsummer the pheasants practically live in the garden, devouring quantities of corn and tomatoes. But we are willing to pay this small price to have them with us, and resent the hunting that is permitted in the town during the open season. Several times bird shot has rained on our windows from reckless hunters, passing through a bit of woods next door.

Although we do not have enough water on our place to attract waterfowl, there are in the town numerous ponds and tidal inlets where mallard ducks congregate and breed. Some of these become as tame as the pheasants and stay with us the year through. My wife's favorite story of last year's hurricane is of seeing a handsome mallard drake, the morning after the blow, waddling proudly down the middle of the main street which was littered with debris from broken trees, as if to say, "Who's afraid of the big, bad windstorm!"

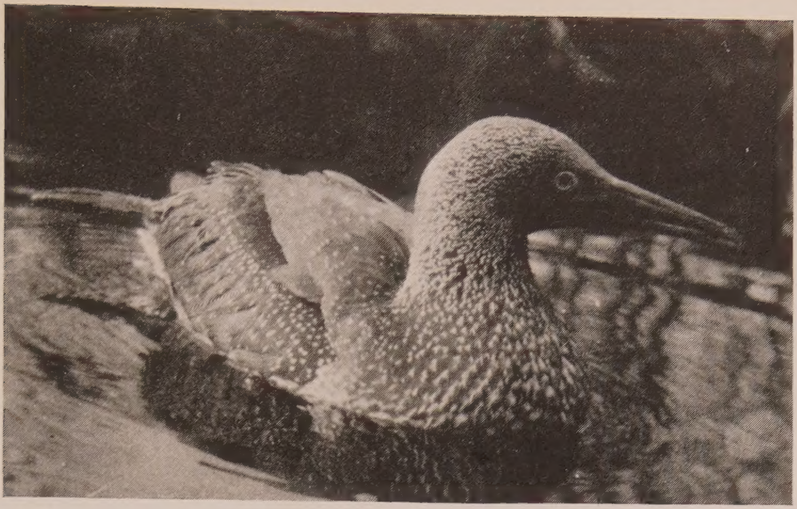
Of birds we have a great many, including a number of migrants that I do not know. Among those that come back each year to nest or for prolonged visits are such favorites as wood thrushes, mourning doves, chickadees, song sparrows, humming birds and red-winged blackbirds; and those that we endure, such as English sparrows, crows, blue jays and starlings. We forgive the starlings for some of their bad habits, including their squeaky voices, when we watch a great flock of them feeding on Japanese beetle grubs in the lawn. The muted murmurings of screech owls make the nights melodious, while the curt croaking of night herons as they fly over reminds us that one of the largest heronries in the state is near by. Large flocks of Canada geese are welcome visitors, and in mild winters often stay in the harbor until spring. We can hear them feeding at night on the mussel beds. Sea gulls are numerous, especially in early fall when they return from northern nesting places; while fish hawks and their cousins of the land are often seen soaring overhead. Little blue herons and kingfishers fish along the shore.

Indeed, I'm sure there is more wild life in this bustling little suburb than there was thirty years ago, or perhaps is today, on the farm where I roamed as a boy in central Ohio. Perhaps it is because our stone walls and brushy woodlots afford better cover than the clean fence rows and tilled fields of a fertile farming country. Rather I'm beginning to think that our wild friends like suburban life. Without making an extensive survey, I have checked with enough people to know that what exists here is not exceptional—that there are numerous suburban and small-town communities where beasts and birds of woods and stream are really learning to live with man and like it.

Water

By ELEANOR ALLEN

Water, dark and sliding slow
Over stones of red;
Water, black, that quiet holds
Jewels in its bed—
Stones of jade and amethyst,
Stones of blue and white,
Water covers them with green,
Guards them from the light. . . .
Only silver fishes know
As they dart and gleam,
All the hidden beauty that
Lies within the stream!



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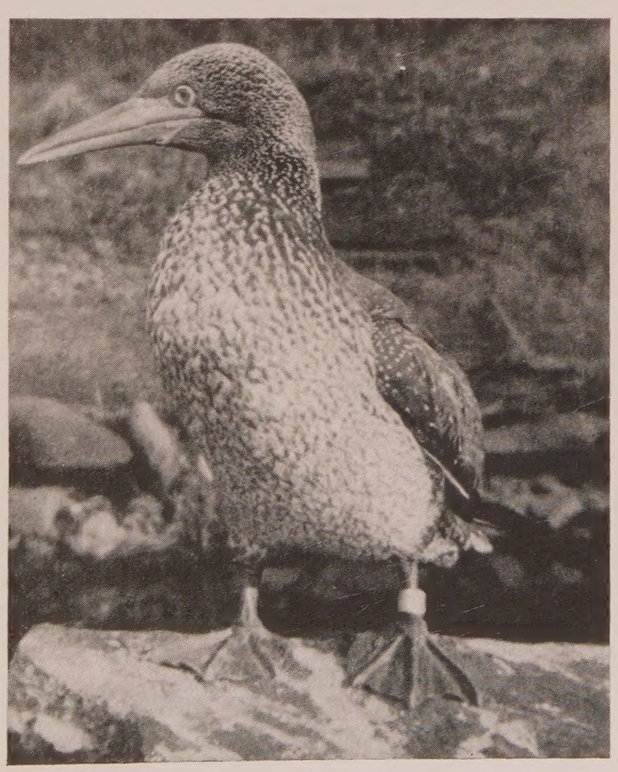
EBENEZER II

By ELAINE MARTIN DREW

“OH, NO-O-O, we couldn't let them stuff Ebenezer after we've had so much fun with him.”

Such a loud wail, but the lungs were lusty and their owners indignant, very indignant. Indeed, the Leader of this Junior Audubon Club felt that it would be little short of sacrilege to part with Ebenezer in any such way. She wanted to be sensible about the matter, but this gannet, for all his six and a quarter pounds, was just a baby bird and so far from home, the hurricane having picked him up from the ocean, tossed him high into the air and carried him two hundred miles or more over into Vermont. If, because he was the first gannet of record ever to visit Vermont, it was absolutely essential that he be turned into a museum specimen, the Leader would be willing—no, not really willing, but would acquiesce, albeit grudgingly, in the interest of science.



EBENEZER AND HIS FOUR-INCH BILL

Above the gannet floats on his Vermont "ocean", the lily pool that served him until he was returned to the Atlantic Ocean

But could not some way be found to give the state its authentic record and also give this interesting bird youngster his chance at "life, liberty and the pursuit of happiness?"

Lucky it is that a gannet can go long without food. Nature gives them early training in that respect. When a young gannet is about three months old, it is deserted by its parents. Then it fasts ten days, or longer, before it jumps from the cliff where it was hatched and flutters down to the sea. It was the night of September 21, 1938, that New England was swept by a tropical hurricane. Eighteen days later a hunter in north central Vermont found, waddling about in the woods, a bird as large as a goose. It was dark grayish-brown, thickly-freckled with white, and had a formidable four-inch bill and great paddles for feet. Such a bird that hunter had never before seen in the woods of Vermont. What kind of bird was it? And where had it come from? It was probably hungry, but what to feed it?

"Look at those webbed feet—three webs, not two like ducks and geese! He must be a water bird. Don't you suppose he'd like fish?"

"No doubt, he would, but we can't get fish for him tonight. We haven't anything except a hot dog. But we don't want him to starve, so let's give him that."

The long bill was accordingly held open.

"Say, what a funny color the inside of his mouth is —light blue-gray! And see that queer breathing apparatus, a slit in the floor of his mouth, alternately opening and closing! He hasn't any nostrils in the upper part of his bill, as most birds have. And where is his tongue? That half-inch structure must be all the tongue he has."

"Well, let's get this hot dog into his department of the interior and make him as comfortable as we can for the night."

Whether this oceanic bird liked the hot dog or not will never be known, but surely he can lay claim to one distinction, that of being the only hot dog-eating gannet that has ever lived.

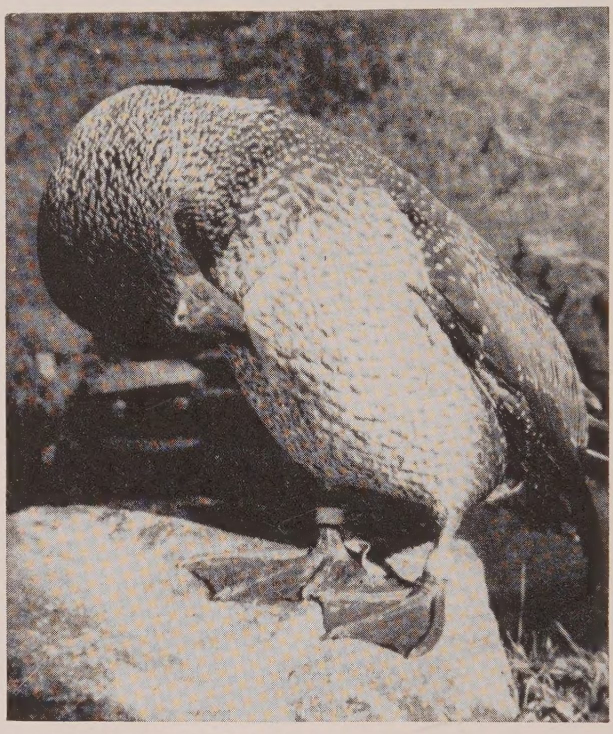
The Junior Audubon Club Leader was rather more than mildly excited when she saw the bird and realized that Vermont was playing host to a live gannet. Then, when she took it to her home, the club members were excited, too, and bombarded her with questions. So they had to scurry to all available reference books, where they found answers to most of these puzzlers.

"What makes you think he is a baby bird?"

"By his baby plumage. If he were an adult, he would be white with black wing tips."

"How old do you suppose he is?"

"Not more than three months. The parents reach their nesting grounds early in April. Their egg (they have just one chick a year) is laid early in May and it takes six weeks to hatch. So he couldn't have been hatched before the middle of June."



PROBING FOR A PESKY PARASITE
Imagine discovering a bird like this wandering about in the forests of Vermont!

"Where was he hatched?"

"On a rocky ledge either in the Gulf of St. Lawrence or near Newfoundland, as these are the only gannet breeding grounds on this side of the Atlantic."

"Well, he must have been somewhere off the Massachusetts coast or farther south the night of the hurricane. If, as you say, he can't fly yet, how did he get there?"

"His feet will answer that question. They are regular oars, you see. He is a powerful swimmer and could easily have paddled, I believe, from the nesting site. When the migratory fish start south, the gannets follow slowly and in the fall can be seen almost anywhere along the New England coast."

"It doesn't seem as if the hurricane could have brought him here, unless he were flying. It couldn't have picked him up off the water, could it?"

"It must have. Picture what probably happened that night. The waves were running mountain high. Our gannet rode to the crest of one of them, where it was an easy matter for the gale with one puff to send him skyward. And what are six or seven pounds on the back of a tropical hurricane? The wonder is he was not dashed against something and killed."

"What shall we name him?"

"Nature Magazine several years ago," replied the Leader, "told of a gannet that was found on Lake Erie, far off its course. They called that one Ebenezer. As we have an Ebenezer, too, suppose we call him Ebenezer II." So, Ebenezer it was, though no one knew, any more than did the Ohioans about their bird, whether it was "Ebenezer or Abigail."

The problem of keeping him alive until proper disposition could be made of him loomed large when he refused to eat. The Leader, however, had handled many small birds and did not intend to let even a six-pound one get the best of her. So force feeding was resorted to, until the children solved the difficulty in a highly satisfactory manner, and feeding thereafter became a regular circus. They would toss pieces of fish to him and he would catch them in the air just as a dog catches scraps thrown to it. When a fish was thrown into the water for him, he would instantly bring his oar-feet into action and with a great lunge would grab it before it reached the bottom. Then, guzzle-guzzle ("Like 'slooping' his soup," one of the children said) and down it would go.

Once when the Leader was feeding him, his quacking was seemingly answered, and there high overhead a honking flock of wild geese was wedging its southward way through the sky.

During the day Ebenezer was kept tethered by the lily pool, from which the goldfish had been removed. It would have been fun to see his reactions toward the goldfish, but the Leader thought the two pounds of fish she bought for him every day expensive enough rations. Yes, two pounds of fish every day! And nothing but fish, if you please! One reference book said that gannets, although living usually almost exclusively on fish, would eat fresh liver. But not Ebenezer! Once, when quite hungry, he did swallow two small pieces, but always after that liver would be tossed aside the moment he realized what he had in his bill.

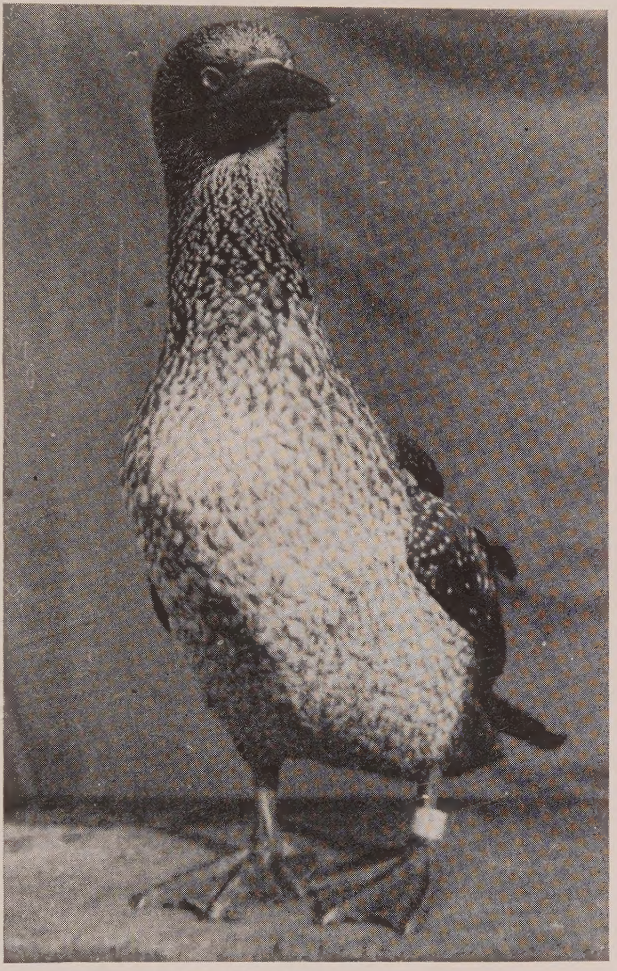
Ebenezer had his own way of letting it be known when he was hungry. He would stand or sit for an hour or two on a stone beside the pool, contentedly preening his plumage or probing for a pesky parasite, until an inner emptiness made itself felt. Then the Leader, watching from the house, would see him look this way and that, then come toward the house as far as his tether would let him. After being fed he would waddle back to stand on his favorite stone until hunger again seized him.

Sometimes the Leader would go to the other side of the pool and hold up a piece of fish, whereupon Ebenezer would jump into the water and swim over for it.

Bathing was an interesting ceremony. Wings would be fluttered (though that is hardly an adequate word to use in speaking of so large a bird) in such a manner that the bird seemed to be wallowing on the water. Sometimes he would thrust his head under the water, extend his wings to their full spread of six feet two inches and slap the water seven or eight times with resounding force—and a free shower bath for any one near. This was all accomplished on the surface of the water, which was too deep for his feet to touch bottom.

Another interesting rite, and one which always brought exclamations from onlookers, was the drying process after the bath, when with mighty flappings of his great wings he would send the drops flying.

At other times than after a swim he would exercise those infant wings, strengthening them against the time when they would carry him far over the ocean in search of his favorite fish. As yet he had not been able to use them. A young gannet does not attain the power of flight until at least five months of age. After jumping from the nesting cliff into the ocean, the youngster rides the waves for several months, his wings, when not being exercised, crossed primly over his back. When at last he has the full use of his pinions and they bear him aloft, it is a magnificent sight. Small wonder that he has been called "the most inspiring inhabitant of the North Atlantic."



EBENEZER IN EXPECTANT POSE

Despite many attempts no more than two photographs were made showing the gannet at his jauntiest

Going to bed was disliked as much by this bird child as it is by the average human child. To be quite fair to him, though, it should be said that it was probably not the going to bed that he disliked, but the method that had to be used in putting him there. It was necessary to pick him up in order to untie the rope from his leg, and he did resent being handled. Once in the improvised cage in the cellar, he did settle down very soon to gannet dreams.

All the camera enthusiasts wanted to take pictures of Ebenezer, but getting close-ups of him became more and more difficult as he became more and more tame. You might have your camera properly focused, but before you could snap it, Ebenezer, usually ready at any hour for a between-meal snack, would swim or waddle too close. Only once or twice was his jaunty air of confident expectation caught on the film.

Every day after school, children came to visit Ebenezer, and on Sundays he held a continuous reception. No wonder the children wailed when it was suggested that he be given to the State Museum. So the Leader laid the case before an eminent ornithologist. What did he think they should do with Ebenezer? Give him to the State Museum? Present him to some zoo? Or band him, ship him back to the ocean and release him? The ornithologist's reply was to the effect that as a general proposition he thought first records for a state should always be represented by preserved specimens, but that when a bird was actually handled and there was no question as to its identification, there seemed no good reason for turning it into a museum specimen.

"Hooray!" and again "Hooray!" from the Junior Audubon Club.

So Ebenezer, wearing Biological Survey band No. 39-802,838, was sent to Boston. There the busy president of a large wholesale company took time to see that he had a proper gannet Thanksgiving dinner, then sent him out to sea on one of his own fishing schooners. All of which delighted the Junior Audubon Club. And more delighted still they were when, several weeks later, the captain of the schooner reported that on another fishing trip they had seen Ebenezer fifty miles southeast of Cape Cod, and that he had come and eaten the trimmings of the fish they were dressing, apparently happy to be back once more in his native element and none the worse for his uneven tussle with the hurricane. And what a tale he has to tell to other gannets as he meets them!

Will Ebenezer ever be heard from again? Only about one chance in a million. But the children, good members of the Audubon Society, lived up to their motto, "A bird in the bush [or sea] is worth two in the hand."

THE LATEST AND FINEST AMONG ARISTOCRATS OF THE BEAUTIFUL DAFFODIL WORLD

AT THE LEFT IS VALENCIA AND TO THE RIGHT HOLLAND'S GLORY, TWO BEAUTIES

BULB PROGRESS

By ADOLPH KRUHM

"WHAT'S new in bulbs?" That question was put to me by your editor one day last May. It came when I was pondering over lists of tulip novelties to be shown at the New York World's Fair. What's new! For two-score years I have been studying horticultural progress, but at no time have I been able to catch up with, let alone keep abreast of, the rapid progress made annually with seeds, bulbs and plants.

Strange to say, the most impressive bulb novelty I have met during the last few years is found among the crocuses. It was at Park Groenendaal, at Heemstede near Haarlem in Holland, in the spring of 1937, that I came face to face with the new giant race, the flowers of which, when open, were every bit as large as early-flowering tulips. The average crocus grown in the average garden measures three to four inches across and blooms three or four days. These giants averaged six inches across, and, because of their more substantial petals, lasted a week. A dozen named varieties boasted a multitude of combinations with contrasty edges, stripes, and such, and with blue, purple and yellow predominating. There were solid colors, too.

The trouble with crocuses in our average home garden is that they are neglected, if not actually abused. Frequently their foliage is cut off before the plant has a chance to feed oxygen to the bulbs in the ground. Small wonder they peter out! And yet, crocuses are decidedly worth while. We look upon them as the happy, frolicking gnomes that bring us the first breath of springtime. Defying winter blasts, these new giant varieties produce, as a rule, three or more flowers from each bulb.

Crocuses really make themselves at home and multiply. Each spring we count more of their smiling faces popping up as soon as the warm sun coaxes them to release their pent-up energy. But to have them feel at home, their foliage must be permitted to ripen, while bonemeal scattered around them, during and after bloom, will help sustain them.

I shall always be grateful to the late Peter Barr, one of Europe's foremost daffodil specialists, for saying "no" to me, back in 1902. I wanted to work for him to study daffodils and his "no" turned me toward America. As luck would have it, some twenty years ago I settled next door to Babylon, Long Island, a town that will some day be known throughout this country as one of the horticultural centers of the continent. At present more than a dozen establishments around Babylon maintain large acreages of daffodils, so I'm living with daffodils after all. Some growers sell the bulbs, others force them into flowers under glass. Among the latter, one man grows more than a million flowers of the variety King Alfred alone, shipping them to all important eastern markets. And it is Babylon that I visit to keep posted on the daffodil, or, to use the proper horticultural term, narcissus.

And while on the subject of nomenclature, let me clarify the situation and answer the question: "What is the difference between a daffodil and a narcissus?" Usage has caused the term daffodil to be applied chiefly to the trumpet varieties, while narcissus is generally used for the Poeticus type. Furthermore, florists sometimes call the yellow trumpet kinds jonquils, whereas every seasoned gardener knows that *Narcissus jonquilla* is the rush-leaved, sweet-scented, cluster-flowering type. All this confusion is unnecessary. Let us consider daffodil as the good old English name for the Latin or botanical term *Narcissus*. Both terms apply to

A WONDERFUL RECENT INTRODUCTION WITH DEEP YELLOW PERIANTH AND GLOWING ORANGE-RED CUPS

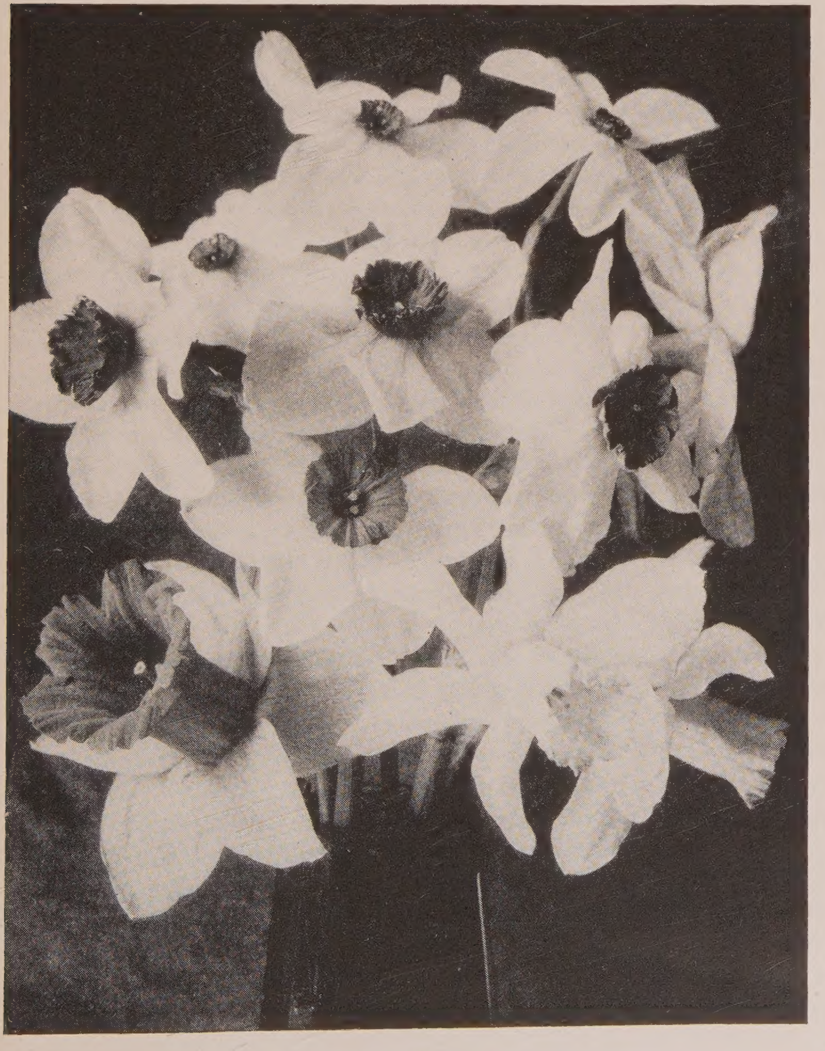
the same group of flowers.

The Daffodil Year Book of the Royal Horticultural Society of England lists more than 2000 varieties in ten broad divisions. In the United States bulb specialists offer between 100 and 120 distinct varieties in these same ten divisions. Obviously it is not possible for any one individual to evaluate the merit of even part of this ever-changing multitude. But there are hobbyists right here on Long Island who grow that many, or more, on their own grounds. Among them, none enjoy a higher standing in the garden fraternity than Louise Aldrich Meissner—a daffodil enthusiast and judge of high ability. Her opinions sustain the following observations about daffodils.

I have already mentioned Peter Barr as a man whose name ranks high in the world of daffodils. Because of his outstanding work as a daffodil breeder, an entire group was named after him. In the Barrii type we have those flowers whose cups, or crowns, measure less than one-third the length of the perianth, or row of segments that surround the cup.

Anywhere from a dozen to twenty varieties of Barrii daffodils may be found listed in the catalogs of the specialists. Comparing a dozen varieties that were considered acceptable twenty years ago with the offerings of today, I find but a single survivor—Seagull. And the reason for this may be found in the just claims put forth in its behalf—it is free-flowering, late-blooming and fine for naturalizing. It is this last characteristic that has won Seagull the lasting place it has held for a score of years. It is a good multiplier and does well in partial shade. Nobility, Lady Diana Manners and Alcida rank among the finest new Barrii.

Unfortunately it seems to be a rare quality among Barrii varieties to survive in many parts of this country. As a British writer puts it: "They are apt to be squiffy". I suppose we would call it



A QUARTET OF DAFFODIL TYPES—TOP, POETICUS ORNATUS TYPE; CENTER, INCOMPARABILIS; LOWER LEFT, BICOLOR TRUMPET; LOWER RIGHT, PINK TRUMPET

JONQUIL HYBRID, GOLDEN SCEPTRE, ONE OF THE NEWER HYBRIDS SHOWING THE INFUSION OF THE TRUMPET STRAIN

"finicky". And considering the great variations in soil and climatic conditions on this vast continent, there is little tolerance for finicky plants of any kind.

However, there is merit and grace and beauty in the Barrii group, and among them, Mrs. Meissner classes Diana Kasner, and the brilliant Cossack and Dosoris, with darker eye and more substantial perianth. Nobility and Dick Turpin, Kilter and Seraglio, among the older varieties, will probably hold their own for another decade. But one factor that seems to rule in the daffodil world is everlasting change.

It happens that I was a privileged guest of the Dutch Bulb Exporters' Association in Holland during the spring of 1937. The privilege consisted in being permitted to attend one of their "behind closed door" meetings and previews of new daffodils. Most of the new creations came from England, where interest in this flower runs high. And the thing that impressed me most was the tendency of the breeders to concentrate on the multi-flowered types in the various classes.

It is a perfectly logical objective to strive for several flowers on one stem and some of the results are phenomenal. I recall particularly that tremendous Triandrus hybrid named Thalia, which I had photographed right then and there. Its stems bore three individual flowers, each of which was every bit as large as some of the largest Barrii.

A great future awaits this comparatively new class, which offers a maximum flower reward from every bulb planted. Another hybrid, this time in the jonquil class, bears flowers almost the size of the old-time trumpet daffodils. And deep, orange-yellow Golden Sceptre is as delightfully scented as the most fragrant among the small Campernel type.

And, of course, this multi-flowered habit is the great inheritance in the Poetaz group—hybrids between the cluster-flowered Polyanthus and the Poeticus Ornatus. Glorious and Scarlet Gem are Poetaz beauties with contrasty perianths, cups and frilled eyes. Among the Poeticus Narcissus, The Sun and Eagle are two decidedly worth while acquisitions.

If there is one class of daffodils appropriately named, it is that known as *incomparabilis*. Incomparable indeed, when it comes to size, variety of forms and appeal to the eye of the connoisseur. The group is a halfway meeting place between the trumpets and the Barrii. Its cups or crowns are from one-third to nearly equal the length of surrounding perianth segments. And in their varying combinations of colors in cups and petals, they stand alone.

Among the newer varieties (still too expensive to make them popular) I would class Fortune, Agra and Merapi. Orange Glow is one of the largest, while Scarlet Lancer is one of the most refined. But you do not have to pay from $1.00 to $6.00 per bulb to meet perfection. John Evelyn at $3.50 per dozen will bring you all the charm that the class holds. With a pure white perianth, a densely-filled cup of lemon yellow, fluted at the base, free-flowering and long-lasting, John Evelyn is one of the greatest daffodils of our times.

For those who like something more flashy, Franciscus Drake will fill the bill. It bears a flower of great size, and the primrose-yellow outer petals contrast strikingly with the densely-frilled deep orange rim that edges the large, deep yellow cup.

The Leedsi group is unique in that it represents the work of a lifetime of one man. Edward Leeds spent fifty years during the early part of last century fixing this type. It brings flowers, the perianth of which is always white. But within it are cups that may be white, pink or pale citron. And the Leedsi class holds some of the daintiest daffodil creations of them all. (Continued on page 409)

Spying on *Thalessa*

By MARY CARPENTER KELLEY

Illustrated by R. Bruce Horsfall

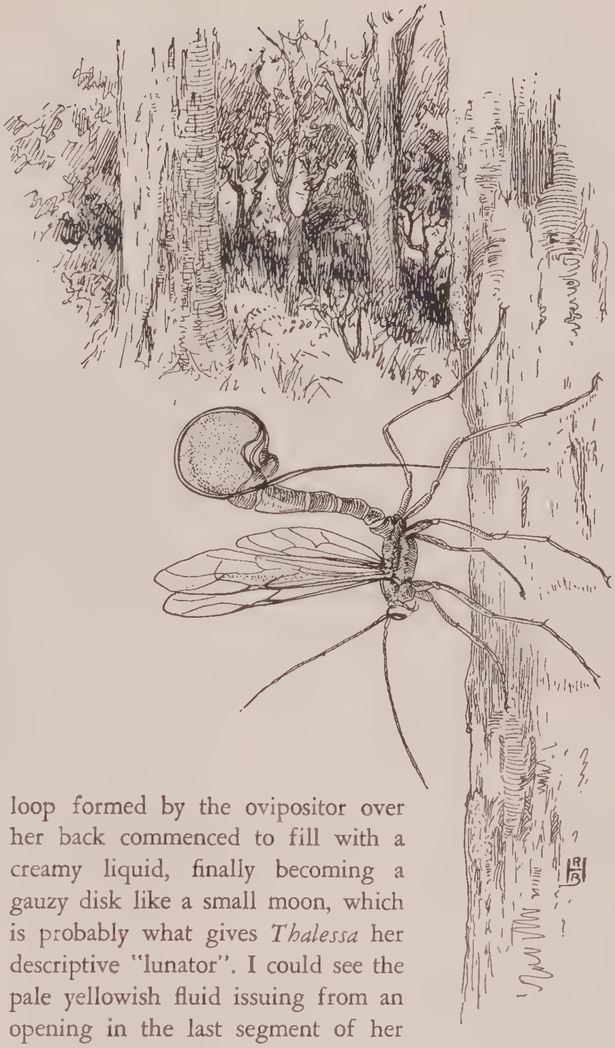
It was a July Sunday afternoon; hot, cloudless, breezeless. We had walked a long way up hill through woods in which the air was stifling, so we were glad to come out into an old lane that meandered along between crumbling stone walls and high-bush blueberries to the cow-yard back of George Moulton's barn. We hoped to find the folks on the front lawn under the maple trees and were eager for a drink of cold water out of George's well.

But the front yard was deserted. The lawn-swing was vacant. The only sign of life was the cat, asleep in the middle of the dirt path from the kitchen door to the barn. "Perhaps they've gone blueberrying," we guessed, deciding to make ourselves at home, in the hope some one would show up to give us a drink of water. Glad took the swing, setting it in motion to get a little breeze, and I threw myself on the ground at the foot of one of the maples. I closed my eyes awhile in relaxation; when I opened them I glanced carelessly up into the tree.

"Good heavens!" I cried, "what are those great bugs with those long tails? Do you suppose they'll sting?" Doubtful, I lost no time in getting away from the tree. The air was full of strange winged creatures each of which appeared to have two or three long black threads attached to its tail. These appendages were five or six inches long. At first I thought them pieces of horsehair in which the big flies, if such they were, had become entangled. Curious, however, I resumed my seat at the foot of the maple, for the creatures seemed to be attracted to this particular tree, and I wanted to find out why.

A number of them alighted on the trunk and all began the same strange actions. Concentrating on the one nearest me I took notes on its every motion. I came to the conclusion at once that these were females because others similar but smaller, and having no tail-feathers, so to speak, were flying aimlessly about. "My" insect selected an area of bark and began to explore it carefully with two long feelers attached to her head.

Having, evidently, found that which she sought, *Thalessa lunator,* one of the 1140 kinds of ichneumon flies, as I identified her later in the day, now turned about with her head toward the base of the tree. She elevated that long black appendage, which now looked like three horsehairs twisted into one, bent it down over her body until it formed a loop as large as a ten-cent piece, brought the end down between her two long, yellow, hind legs, curving her six-segmented body into a half circle as she did so, and inserted the tip into a hole in the bark. Bracing herself sturdily with all six legs, she pushed the ovipositor, for this is what I had by now decided the mysterious horsehair to be, into the tiny opening and pushed and pushed until she could drive it in no farther. Then a strange thing happened. The circular space within the loop formed by the ovipositor over her back commenced to fill with a creamy liquid, finally becoming a gauzy disk like a small moon, which is probably what gives *Thalessa* her descriptive "lunator". I could see the pale yellowish fluid issuing from an opening in the last segment of her horny, brown body as she raised her wings and began to pump with a slow, regular rhythm. She pumped and pumped for what seemed a long time—ten or fifteen minutes I should say—and then the lunar disk began to shrink. The enclosing loop of black contracted gradually, and both vanished just as the aperture in the tail segment closed.



Her work finished, *Thalessa* stood motionless for a time, as if resting. I expected now to see her withdraw the ovipositor, straighten it out, and flit away for refreshment, for she had certainly worked long and hard. She seemed to make a casual effort to withdraw the ovipositor. It did not yield, so she tried again and with no better luck. Then she paused, braced her feet firmly, bent her body into an even greater arc than before and made an obviously powerful attempt to pull the thing out, but without success. She now appeared frightened, raised and lowered her wings, beat the air with them, moved her little hooked feet about to get a new grip on the bark, and again struggled frantically.

This, too, resulted in failure, so *Thalessa* settled down to desperately hard work, pulling and resting alternately. I watched her for two hours. Then I went for a walk hoping to find her free upon my return. But when I got back she was still working, tugging and pulling doggedly, although much weakened from her long and steady efforts.

At dusk I could not wait longer to see what became of her, but I had discovered ill omens. All up and down the trunk of that big maple were wisps of "horsehair" protruding an inch or so from tiny holes in which they were held as in a vise. I pulled on several as hard as I was able and could not remove them, so what hope was there of *Thalessa's* regaining her freedom unless she did so at the expense of a torn body? She might be eaten by bird or squirrel while held captive, but whatever fate was to be hers, *Thalessa* was engaged in relentlessly depositing her eggs in the hole of the pigeon horntail so that her own young could feed upon the helpless larvae of the borer.

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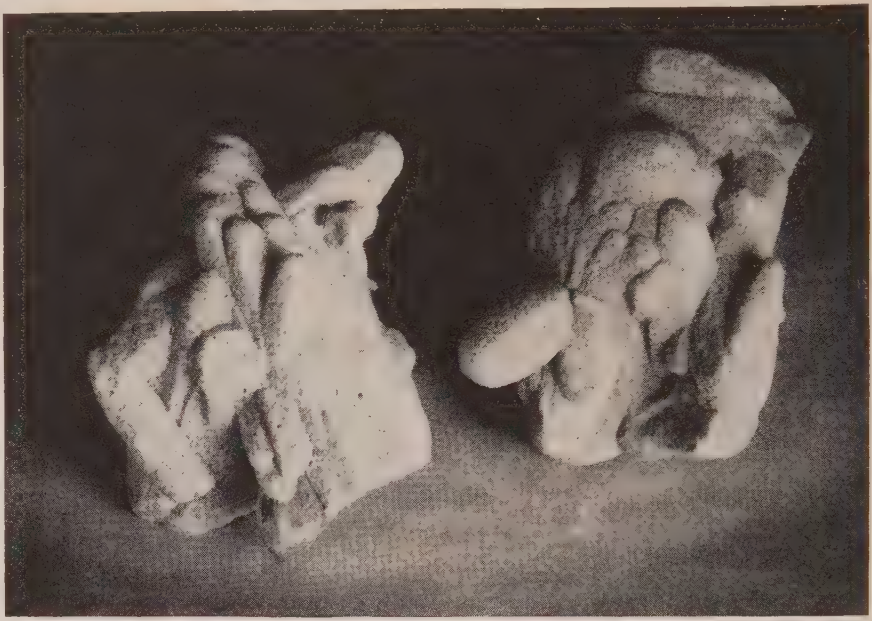
Sand Crystals

By C. S. GWYNNE



PHOTOGRAPH BY MARGARET BONINE FOX

SAND CRYSTALS FROM SOUTH DAKOTA

Two outstanding specimens formed by calcite as it cemented the sand grains together into these strange shapes

We all know crystals of salt or sugar and of some other chemical substances. Even crystals of some minerals are fairly well known, but have you ever seen crystals which consist largely of grains of sand? The ones shown here are of the latter kind. For want of a better name they are often called sand crystals. The mineral that is responsible for the crystal form is calcite, so the resulting masses are often called sand calcite crystals.

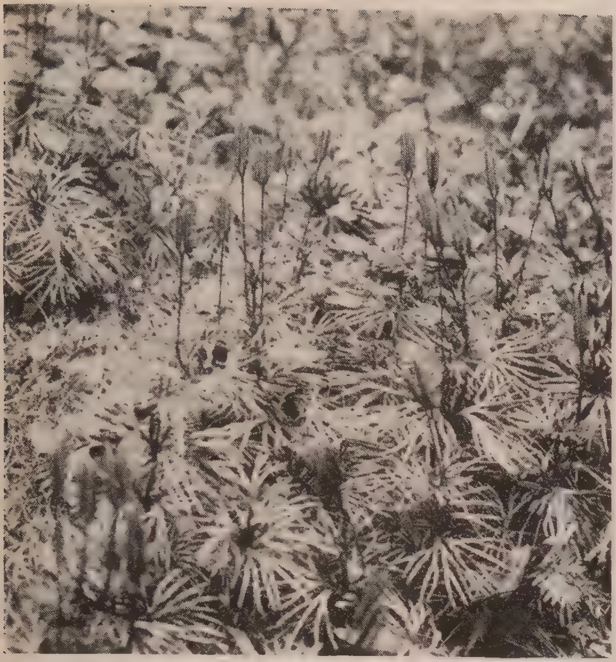
The specimens in the illustration came from the Rosebud Indian Reservation in South Dakota. There, on Rattlesnake Butte, they occur in great abundance. They are known in only a few other parts of the world, and nowhere else do they reach such perfection. The top of Rattlesnake Butte is covered with loose sand, with beds of sandstone sticking through here and there. Masses of the sand crystals are found in this loose sand. The sandstone, when swept clear of the unconsolidated sand, will also be found capped with masses of the crystals.

What is the secret of the formation of these sand crystals, and why is only a part of the sand in this form? You probably have seen the hard rock called sandstone, but may never have realized that sandstone was once nothing but free and easily moved grains of sand, the same as that beside a stream or on the beach. This material became sandstone when the grains were cemented together by a mineral substance. This mineral substance was dissolved from the solid matter in the earth and deposited by the subsurface water as it was soaking through the mass of sand. One of the most common of these cementing substances is the mineral known as calcite. When calcite occupies an open space such as a cave it has the habit of forming long six-sided crystals capped by pyramids.

Crystals of the mineral calcite cleave readily in three directions parallel to the faces of a rhombohedron. These sand crystals, when broken, show these glistening cleavage surfaces. There are sandstones in many parts of the country, which, when broken, show the cleavage surfaces of the calcite that has cemented them together. This indicates that such sandstone is much like the sandstone of these crystals.

Under usual circumstances, in cementing sandstone grains together the calcite does not have a chance to develop crystals with good outlines. Instead they are all jumbled together and form a continuous mass. However, in the case of these specimens from South Dakota the crystals were able to develop their very definite shapes even though they were forming in sand. The looseness of the sand in this locality probably facilitated the free growth of these crystals. Another point is that only a part of the sand is changed to sandstone. While water is the medium by which the calcite is brought in contact with the grains of sand, time is also a necessary factor in the growth of the crystals. Given enough water and a sufficiently long period of time the bed of sand would no doubt have been transformed into a bed of sandstone solidly cemented by calcite.

At the present time we find the crystals surrounded by loose uncemented sand, or attached to the top of the bed of sandstone, with loose sand lying above. Only rarely do we find the crystals in such perfection of growth as is the case with these from South Dakota. The quality is so high that they find a place in museums all over the world.



THE COMMON GROUND-PINE

Several distinct cones are borne upon upright slender peduncles. The branches are flattened, spreading and much divided; leaves small and bristly

GROUND-PINE AND ARBUTUS

The club-mosses form a beautiful background for many of our wild flowers, growing in close association with them as shown in this picture

THE MODEST CLUB-MOSSES

By S. JUDSON EWER

Photographs by the Author

GREEN is Nature's own color. From the tree-tops to the humblest herb of the forest floor it is predominant. In varying shades it clothes nearly the entire world of plant life. It forms the setting for the most brilliant flowers and gives a harmonious background for the gaudy pageant of bloom that runs throughout the seasons. Yet how much greater is our admiration for the flowers themselves than for the greenery that so much enhances and reveals their beauty. And what of the vast host of spore-bearing plants that have no flowers at all, and yet by their gamut of greens add greatly to the beauty of the landscape? Without the ferns and club-mosses our forests would lack much of their attractiveness. If there were no woodlands strewn with the running branches of the ground-pine, no mountain sides gleaming with a dark green carpet of shining club-moss, how much the poorer we should be! The rare orchid that we all admire would be far less missed, should it become extinct, than would the common club-moss over which we walk with such careless concern. We could well look at these club-mosses a little more closely on our next trip to the woods, and see if we can recognize their various types and kinds, thus gaining a greater appreciation of their life and habits.

THE GLAUCOUS CLUB-MOSS

It sometimes forms large patches in open pastures. The leaves bear a heavy bloom, giving it a blue-green color. The creeping stems are buried deep in the soil

In the first place they are not mosses at all, but belong to the great plant group that includes the ferns and horse-tails. They bear little resemblance to the true mosses, although their leafy stems and spores might at first seem to suggest some distant relationship. The word "club" doubtless has reference to the club-shaped cones in which the spores are usually produced.

The club-mosses have a venerable lineage. Many millions of years

COMMON CLUB-MOSS

The cones are raised on distinct scaly peduncles, often in pairs. Children often call them "knives and forks". Below may be seen the densely leafy stems of the plants

ago they grew and flourished in great abundance in the swamps where our coal was formed. Some were tree-like and towered a hundred feet in height; others were lowly herbs similar to the present forms. The giants have now become extinct, and only by patient study may we dig the story of their existence from the fossil record; the slight herbaceous types have lived on and form a connecting link with those living today—insignificant remnants of a once proud race.

There are now approximately one hundred club-moss species distributed from the arctics to the tropics, and of these seventeen species and several varieties occur in our North American flora north of Mexico. All are small, rarely a foot in height, upright or creeping. They are characterized by the numerous small leaves arranged spirally or in whorls, and by the production of spores formed in tiny sacs, or sporangia, located in the axils of the leaves and usually grouped toward the stem tips into more or less definite cones.

The fir club-moss, *Lycopodium selago,* and the shining club-moss, *Lycopodium lucidulum,* are most simple in appearance. The forked stems rise only a few inches and are thickly clothed with small, pointed, evergreen leaves. The sporangia are small, bean-shaped sacs occurring at the bases of the green leaves and more or less confined to the upper parts of the stems, although no distinct cone is formed. In the shining club-moss, zones of sterile leaves alternate with those bearing sporangia. Little plantlets called bulbils, or *gemmae,* are found in some of the upper leaf axils. These are easily discharged, take root in the soil, and grow into new plants. The fir club-moss is characteristic of the far north, where it is circumpolar in range; in this country it extends southward to the alpine summits of New England and the higher Appalachians. The shining club-moss is often abundant in moist woods from southern Canada to the mountains of South Carolina.

The marsh club-moss, *Lycopodium inundatum,* and the foxtail, *Lycopodium alopecuroides,* are slightly more complex. Both are water-loving species, the foxtail being characteristic of the pine barren swamps of the Atlantic coastal plain. The marsh club-moss ranges from northern New Jersey to Newfoundland and Alaska, and in northern Europe and Asia. The spore-bearing leaves are confined to the tips of the upright stems and compacted into shaggy cones. There is a main creeping axis that roots at its tip, and, in the foxtail, becomes greatly enlarged at the end of the growing season. This swollen stem tip stores food, buries itself in the soil, and preserves the plant during the winter.

The stiff club-moss, *Lycopodium annotinum,* possesses an elongated creeping stem with upright, densely-leafy branches. Firm, yellowish-green cones are borne at the tips. The narrow, pointed, dark green leaves extend to the very base of the cone, but the leaves of the cone itself are entirely different, broader, yellow-green, overlapping and closely compacted. When mature these scale-like leaves

THE STIFF CLUB-MOSS

Here we see the horizontal stem that creeps among the leaves on the forest floor, and the stiff, upright cone-bearing branches. This specimen is a stout variety from the mountains

THE TREE CLUB-MOSS
It has the appearance of a tiny evergreen tree, and is known as *L. obscurum.* Here it grows half-hidden by ferns and creeping plants

spread apart, and the sporangia in their axils split, and shed the numerous yellow spores.

In certain club-mosses the cones are separated from the main leafy stems by stalks that bear a few, small scaly leaves. Such a stalk serves to raise the cone into the air, where it may be swayed by the wind and thus aid spore dispersal. This separation of the spore-producing part of the plant and the food-making portion gives a distinct "division of labor" of the plant's major activities. Such a condition is to be seen in the common club-moss, *Lycopodium clavatum,* the common ground-pine, *Lycopodium complanatum,* and its more spreading southern variety, *L. flabelliforme,* and in the glaucous club-moss, *Lycopodium tristachyum.*

The common club-moss has a leafy stem that creeps extensively along the soil surface and roots from the lower side. Short upright branches are produced, some of which bear the almost naked stalks, each tipped by the one to several cones.

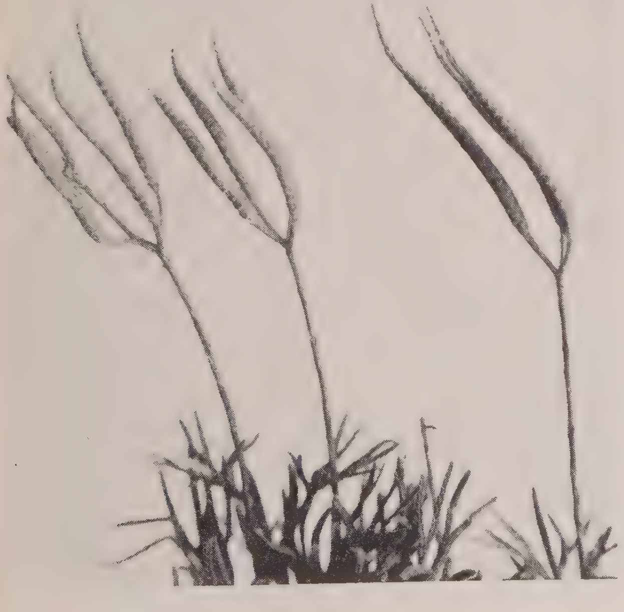
The common ground- or running-pine, used so extensively for Christmas decorations (and called "trailing Christmas green" in some botanical treatises), creeps along the ground with its stem concealed by the dead leaves and twigs that mat the forest floor. The upright stems branch profusely in a fan-like manner and are flattened and green; all leaves are small, bristle-like points, and food-making takes place largely in the flattened green branches. Three or four narrow cones, like candelabra, are borne upon slender, scaly stalks.

The glaucous club-moss is similar to the ground-pine, but the upright portions are less spreading and bear a heavy bloom. The creeping stem lies buried deeply in the soil.

The tree club-mosses, *Lycopodium obscurum,* and its variety, *L. dendroideum,* have much-divided branches that are leafy to the bases of the several cones. The cord-like creeping stems are entirely subterranean, and may be several inches below the surface of the ground. The similarity in appearance to diminutive evergreen trees suggests the common name.

Club-mosses are typically plants of moist woodlands or sunny hillsides. The ground-pine trails luxuriantly along forest aisles, or extends outward into the more open places, where, somewhat dwarfed, it often produces cones in superabundance. At times it creeps among the pine needles or along the outskirts of hemlock groves, where it associates with the pink lady's slipper, the one-flowered pyrola, the pipsissewa, the partridge berry, and the trailing arbutus.

Deeply rooted and creeping species, such as the tree and glaucous club-mosses, sometimes form complete circles that widen year after year as the plants continue their outward growth. At the outer edge are the new shoots; a little farther inward the spore-bearing parts of the current season; then the old shoots of the previous year with their dried cones; in the very center few or no plants whatever, the older growths having died and disappeared.



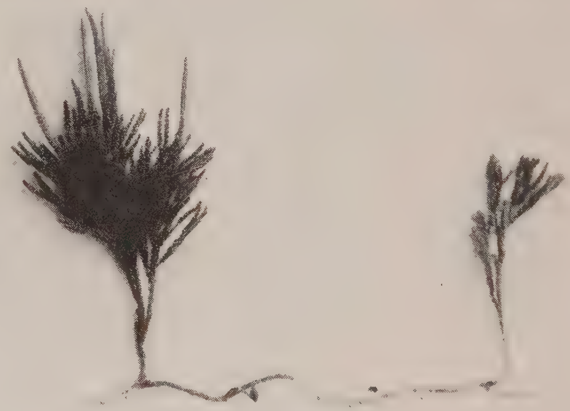
FRUITING CONES OF THE COMMON GROUND-PINE
The cone scales are closely set in imbricated rows, and conceal the small sacs filled with the dust-like spores. This specimen shows continued pointed growth of the tips of the cones

Club-moss cones are matured in late summer and fall. When the dust-like spores are collected in quantity they comprise what is known as "lycopodium powder", a material highly inflammable, resistant to wetting, and of value in pharmacy and as an insecticide.

The spores serve the plants for reproduction, and in them resides the ability to germinate and give rise to the alternate phase of the life history—the prothallus or gametophyte (sexual plant). This tiny structure—really a distinct plant and entirely separated from the spore-bearing plant—varies considerably among the different club-moss species. All are small and difficult to find or observe. They vary in being entirely saprophytic—living upon dead organic material—and subterranean; partially aërial and green; or entirely aërial and growing under the bark of trees, as in certain tropical forms. Some are fleshy and tuberous, others elongate and branched, or swollen below with tiny green lobes above. That of the fir club-moss may attain a length of two inches, but the majority are much smaller. When exposed to light they become green and manufacture food, but all are at least partially saprophytic and must have a fungus ally living within their cells if they are to grow and function properly. There are no roots, but tiny hairs serve for anchorage and absorb water and nutrient materials.

STIFF CLUB-MOSS

This species has somewhat the appearance of the shining club-moss but has a creeping stem and well-defined cones



TREE CLUB-MOSS

Younger and older fruiting parts rise from a horizontal stem that creeps extensively beneath the soil surface

The function of the prothallus is to produce the sex cells. The male cell or sperm swims to the egg, fertilization is accomplished, and a new spore-bearing plant develops. This grows to maturity, produces cones and sheds its spores. Thus is the life cycle from club-moss to club-moss completed, a process not easily accomplished and often taking many years for its fulfillment. As we see the club-mosses trailing through the woods we little realize how long and precarious—and how relatively unknown—are the processes by which these plants complete their life stories. Millions and millions of spores are produced each season and wafted away by the winds. Nature is provident in providing that the thread of life may be continued in a world where conditions are often far from favorable. Most of our club-mosses come from continued yearly growth of the creeping stems and the scattering of bulbils; few spores ever live to initiate and carry through the obscure reproductive processes for which they are spread far and wide over the countryside.

This, in brief, is the story of the club-mosses. They trace their lineage backward into the dim ages of the geologic past; they carry on their life processes quietly and without the display of gorgeous color of flower or foliage; they add their quota of green to the enrichment of the forest floor; they enliven the drabness of the winter woods. But let us not be content merely with using their living green to brighten our homes at the holiday season; let us rather observe their growth and habits at all seasons of the year, making them our friends and companions even as are the more showy and much more numerous flowering plants. It is not wise to overlook the less spectacular of Nature's offspring.

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SHROUD

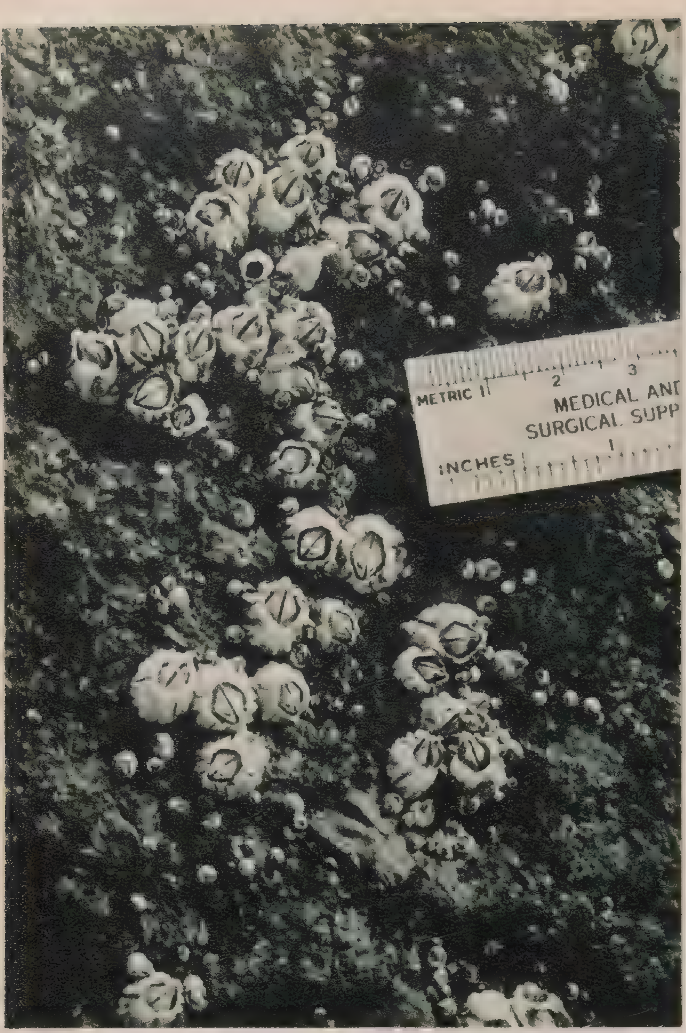
By OSCAR OSTLUND

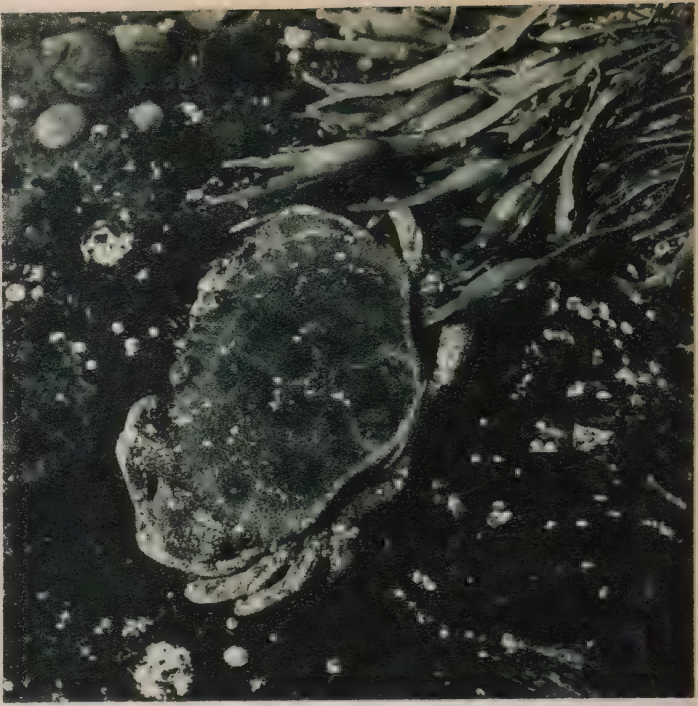
In wild domains, roads, paved and neat,
Put Nature in a winding sheet.

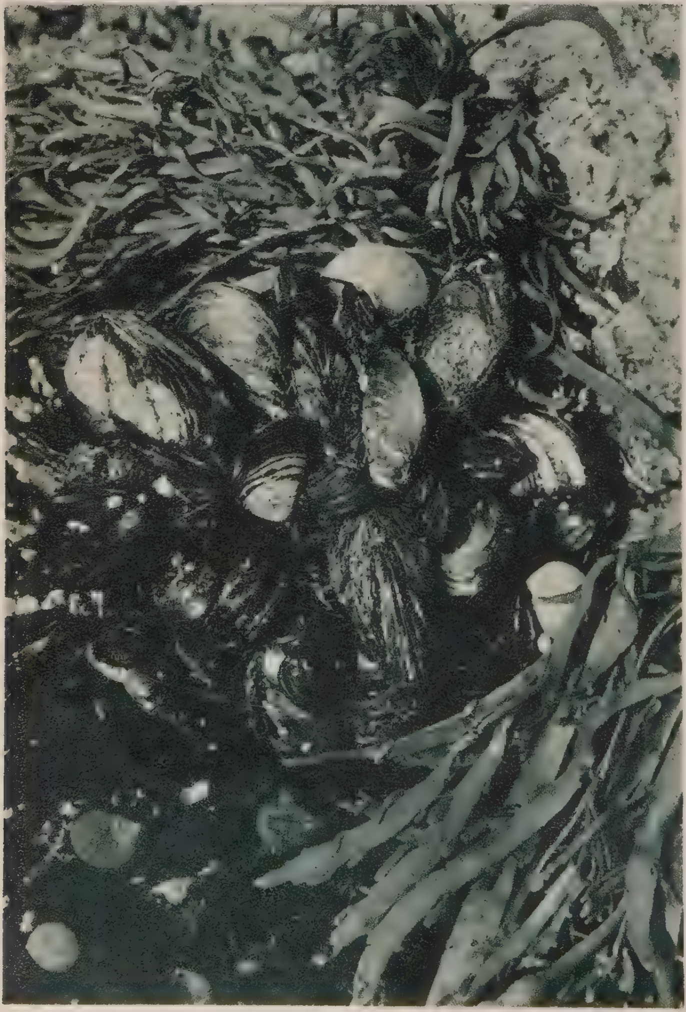
The Kingdom of the Tides

As recorded by Henricks Hodge

Like a ring around every land mass on this earth of ours is a kingdom that is half terrestrial, half aquatic. When this is submerged its subjects come to active life; when the water has temporarily left it the creatures of this realm are quiescent, awaiting the return of the tide, for their life depends on the salt water. Only in those crannies, crevices, and basins along the shore, where the departing tide leaves water behind, can life go on uninterrupted. To such places—tidepools at ebb tide—one must go to see the dwellers of this watery realm. On these pages we see a few common inhabitants of a New England tide-pool, creatures there for all to see.







Common barnacles dwell in the zone of rock and are well able to stand the daily drought. Four tiny valve-like plates retain moisture until the tide returns, when they reopen, and feathery, net-like feet are thrust out to snare tiny water creatures that are drawn within the limestone house of the crustacean.

Beneath the rockweed fringe hides a rock crab, *Cancer irroratus*, its yellow shell densely dotted with red. Crabs and snails are tide-pool scavengers.

Just below the barnacles we see mussels, *Mytilus edulis*, attached to the rock. In Europe the species is prized as food. Around them is a common brown alga, *Ascophyllum nodosum*.

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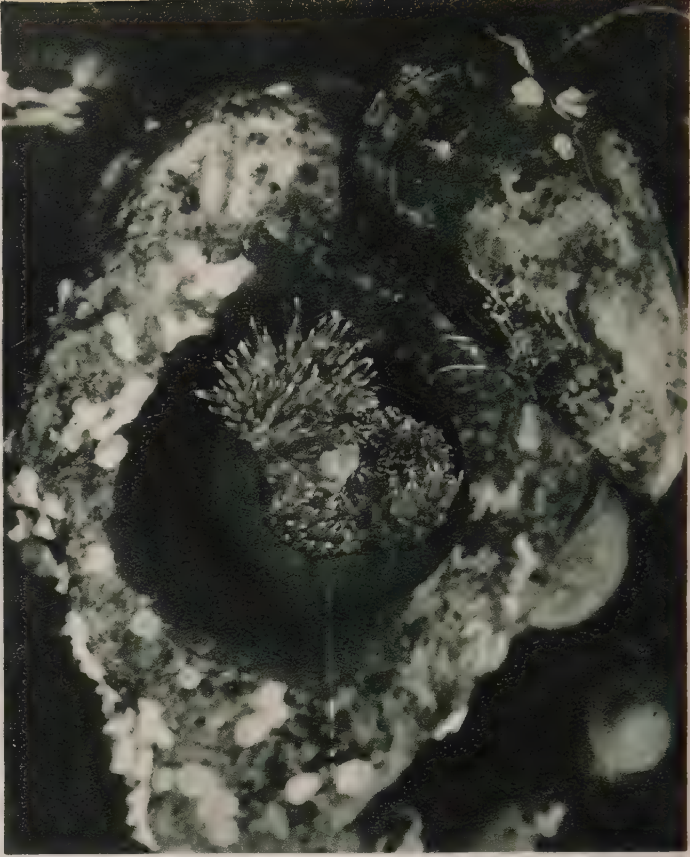
The common starfish, on the opposite page, varies in color from reds and oranges to blues and purples. Thrusting out from its lower surface hundreds of tiny tube-feet, it moves slowly over the barnacle-covered rocks.

Encrusting submerged rock shelves is the green breadcrumb sponge, *Halichondria panicea*. Its central, chimney-like orifice is the channel through which departs the water that has entered through pores in the "chimney" sides. En route, the water has left microscopic food. Lower left, a hermit crab, *Pagurus*, occupies the shell of a purple snail. The common sea-urchin, found in our northern waters, is near it.

Larger, tougher, and predominant in salt water, are the brown cousins of the delicate fresh-water algae. Bladdery "water-wings" keep the plant afloat. The tiny dots contain the reproductive cells of this rock weed, *Fucus vesiculosus*.



The purple snail, *Thais lapillus*, found on rocky shores in the North Atlantic, is shown above (at the left) depositing its encapsuled eggs on a rock. A tiny yellow snail, *Polynices*, enemy of bivalve molluscs, is beside it. With a sharp-toothed "tongue", this snail, which is commonly called "drill", perforates the shells of its prey, leaving the small round holes so familiar to all who pick up the shells of the sea-shore.

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In the shady corners of the deeper pools, above, are animals with flower-like beauty—sea anemones. Petal-like are the retractile tentacles that surround the central mouth, and, with these, tiny swimming creatures are caught. Stinging cells on the tentacles kill the prey, and it is then conveyed to the mouth. This anemone, partly contracted, is sharing its point of attachment with a common mussel.

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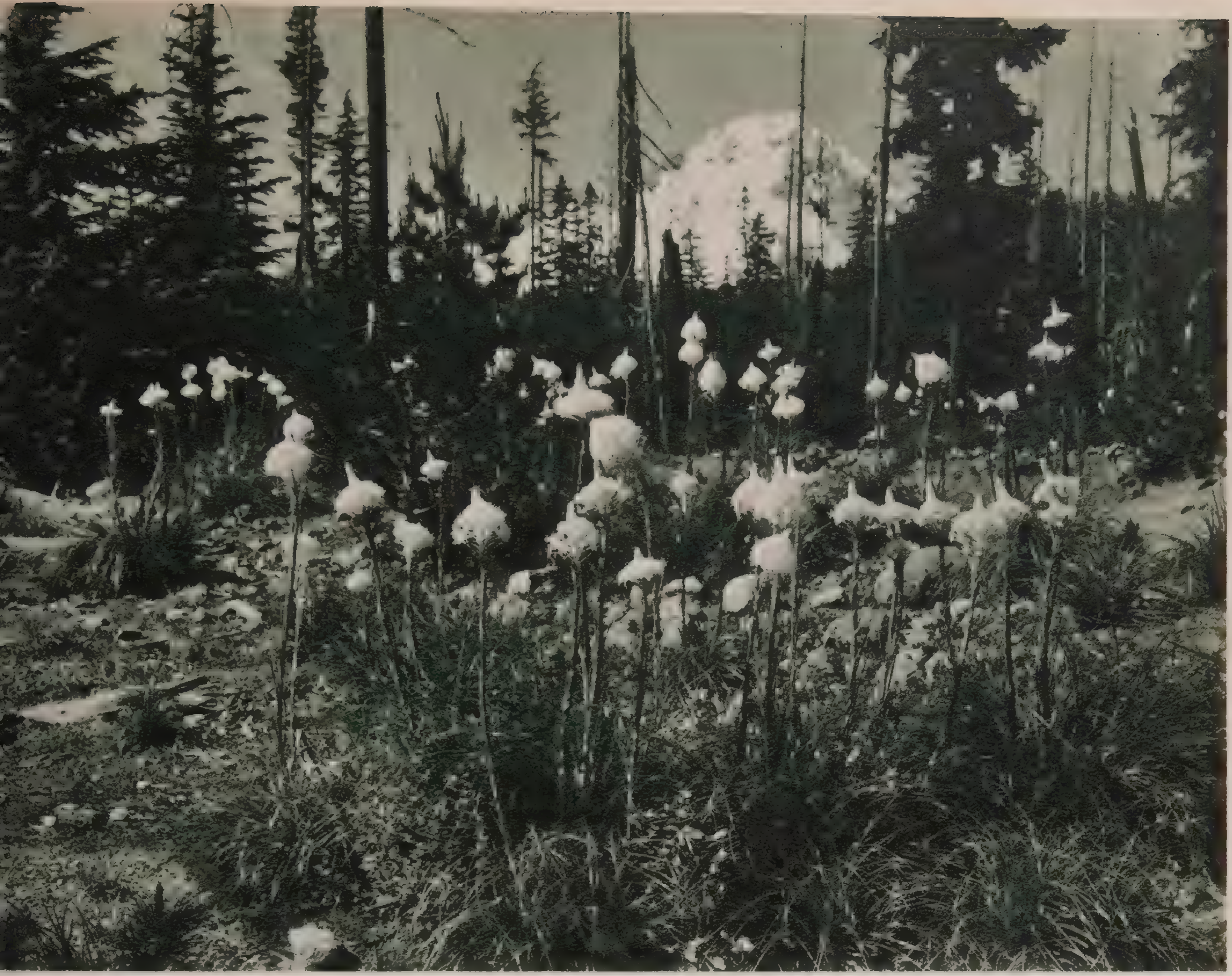
Also in the deeper pools are more delicately-armed sea stars, such as these daisy brittle-stars, *Ophiopholis aculeata*, here seen in companionship with their cousin, the porcupine-like green sea urchin, he of the long name *Stronglocentrotus drobachiensis*. Long tube-feet, like feelers, may be seen thrusting their way out from the base of the green spines.



A flower salute to the snow-clad peaks, bear grass grows abundantly on the high ridges, its blooms for a time redeeming the open barrens. In Indian lore we find that the women formerly made annual pilgrimages to the high places to gather a harvest of its narrow leaves. These they wove into vessels tight enough to hold water for cooking. This provided the alternative name of squaw grass.

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BEAR GRASS BLOOMS

By MILO R. CLARE

Winter releases its grip slowly, grudgingly, atop the high Cascades of Oregon and Washington. In May, with the first breaks in the snow mantle, a few venturesome alpine plants burst into scattered bloom. Gradually other plants of less intrepid spirit push forth their tender flowers, until by the end of June or early July the alpine gardens attain their greatest variety and splendor. But the fullness of alpine spring is not reached until mid-July. Then it is that the bear grass sends aloft its graceful spikes of white blossoms.

Bear grass, of course, is not a grass at all, but a lily known to botanists as *Xerophyllum tenax.* It gets its name bear grass from the fact that these animals dig up the rhizomes for food, and is also known as squaw grass because the Indian women used the narrow leaves for weaving baskets. It is also popularly known as pine

A flower head consists of a large number of florets compactly grouped on a central support. The ripening of the florets moves from base to apex, assuring a prolonged blooming period, which is an advantage in places where the weather is certain to be fickle and growth difficult.

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lily, which is its most accurate popular name.

Bear grass grows from a short, thick and woody rhizome, from which rises a large tuft of wiry, grass-like leaves. These spread out like a miniature clump of pampas grass. It is found in the Hudsonian mountain zone from British Columbia to California.

It must be a stolid person indeed who can behold with indifference the spectacle of this plant in bloom. The heavy, woody flower-stalks rise high above the parent leaves, crowned by a club-shaped crowded spike of densely-packed flower clusters. The individual florets are star-shaped and about a half-inch across. They mature progressively from the base of the flower cluster to the apex, changing from greenish to a dazzling white as the season progresses and they become full-blown. Nodding blithely in the breeze, the profusion of white heads clothe the burned-off lands and rocky wastes with soft raiment, making a summer scene of rare beauty.

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As the flower head comes into full blossoming it releases a pungent odor that, while usually not particularly pleasing to humans, attracts many insects, including bees. Thus are the plants cross-fertilized, enabling the bear grass to maintain itself on this cold and high frontier of plantdom.

Camp Neighbors

By LLOYD and ELIZABETH INGLES

The flute-like song of the russet-backed thrush awakened us on our first morning in camp near Mt. Shasta. Following the lilting tones, we found the bird in a nearby thicket of raspberries. Hopping to a cascara bush, the thrush threw up its head, and, with speckled throat throbbing, repeated in an ascending spiral its musical "whip poor poor ree ree re re". An instant of silence and a second singer poured forth his response from a dogwood close by. As soon as the last high-pitched note blended into the melody of the wind in the trees, the first thrush answered, as though defying the intruder to settle in his territory. Quietly watching the first bird, we soon saw his mate disappear into the briar thicket, within which we found a cup-shaped, leaf-lined nest of rootlets and grass. Built about a foot and a half from the ground, it contained four eggs of robin's-egg blue spotted heavily with lavender and brown.

Here was beauty and tranquillity, a lesson in peace and brotherhood in a troubled world. Suddenly there was a quick movement, and the slender brown head of a full-grown long-tailed weasel, *Mustela frenata nevadensis*, emerged from beneath the floor of the tent. Was this a traitor in a little bit of Paradise? What of the tales of pillage attributed to this graceful predator? We fancied the birds' nest destroyed; the broken-hearted thrush no longer waking us with his soul-lifting song.

Memory held other tales of weasels catching and killing full-grown birds, and we quickly plotted the downfall of this intruder. As though sensing hostility, or, perhaps, because of an unconscious movement, the lithe creature disappeared with a flourish of its black-tipped tail.

All that day we were concerned about the thrushes' nest, and fears were further aroused when a smaller weasel was seen to run beneath the tent floor. Since the old weasel might have a nest there, we decided to investigate as soon as possible. In the meantime we set several live traps to catch the weasels to photograph them. During this time they were seen every day, but the birds' nest was not disturbed.

When the floor was finally raised we found a nest fashioned mostly of fine grass and lined with meadow mouse fur, and filling a pocket a foot deep. The nest was empty, but at one of the two entrances was the freshly beheaded body of a meadow mouse. Within a distance of three feet of the nest were bits of skin, fur and remains of meadow mice. There were no feathers! The nest was left undisturbed, for there was no evidence that the weasels were the rascals we had believed.

The next day, two two-thirds grown weasels were taken in the live traps. Photographed, they were placed in a large wire cage for observation, and, for a couple of days, got along well on the diet of live meadow mice we provided. They were timid and spent most of the day in a straw-lined box in one corner of the cage. On the third day the weasels refused to eat the eggs we cracked for them, and late in the afternoon the female dined on the male.

The thrushes never seemed to be disturbed by the presence of the predators. In fact, the three weasels were seen to run beneath the low nest without paying any attention to it, and without either of the watchful old birds taking alarm. When the eggs hatched, the young birds were not disturbed. We watched them grow and finally fly away, while all the time what we had thought to be a bitter enemy ran beneath their nest.

Indeed, the old long-tailed weasel and her family of five won our respect and admiration. True, weasels do occasionally eat birds and eggs, but it was evident that the long-tailed weasel does not specialize in such plundering. It is likely, of course, that this species of weasel would eat bird life if rodents were not plentiful, but observation of their habits and the remains in the nest show that they prefer small mammals.

It was only coincidence that shortly after the little thrushes left their nest, the weasel family moved out of our neighborhood. However, we felt strangely bereft without the dainty musician of the briar thicket balancing on a slender twig as he poured forth his varied and beautiful song, or the sleek, brown body of the graceful weasel darting beneath a raspberry bush. Indeed, this little experience brought closer the realization that the way of Nature is always the best, and that human interference, no matter how well meant, is usually responsible for upsetting a balance evolved long, long ago.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

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THE WATERFOWL SITUATION — 1939

The report on studies made of the breeding and wintering habits of our waterfowl during the autumn, winter and spring of 1938-1939 was announced about the end of May. As this report was made public, the Bureau of Biological Survey was about to begin studies in the northern nesting grounds, where the birds were already breeding.

In these accounts of waterfowl status issued during the past few years, we have looked in vain for any general report that makes adequate allowance for several factors that affect adversely the waterfowl population. These factors include: the kill, legal and illegal; the effect of shooting in successive zones as the birds migrate south in the fall, thus subjecting the northern-bred birds to excessive seasons; hunting in Mexico by United States citizens after the close of our open season; and diseases, including botulism, a natural malady, and lead poisoning, a disease caused entirely by man, and one increasingly dangerous.

Careful consideration of these deterrent factors, together with a study of the protective measures, lead to the conclusion that our waterfowl have not been receiving the degree of protection that is popularly supposed, and which they merit. This is apart from consideration of the commendable efforts now being made to provide breeding and resting refuges.

In the report lately issued is a brief reference to the average kill. The Bureau concludes that the average kill per hunter is less than nine birds, but the amount of data that

TABLE I.—SHOOTING SEASONS AND ZONES, 1935—1938

Seasons and Zones, U. S.	Mainly or including September	Mainly or including October	Mainly or including November	Mainly or including December
1935 30 days in each of three zones.	N. Alaska: Sept. 1-30. N. Canada: Sept. 1-Dec. 14.	S. E. Alaska: Sept. 20-Oct. 19. N. Canada: Sept. 1-Dec. 14. B. C.: Sept. 15-Dec. 14.	N. Canada: Sept. 1-Dec. 14. S. Canada: Sept. 16-Nov. 14. N. States: Oct. 21-Nov. 19.	Zone across U. S., Va. to Calif.: Nov. 20-Dec. 19. B. C. (part): Sept. 15-Dec. 31.
1936 30 days in each of seven zones.	N. Alaska: Sept. 1-Sept. 30. W. Alaska (part): Sept. 15-Oct. 15.	S. E. Alaska: Oct. 1-30. N. E. and some border States: Oct. 10-Nov. 8. Most of Canada during Oct.	W. Alaska (part): Nov. 1-30. Zone across middle U. S.: Nov. 1-30. Much of S. Canada during Nov.	Zone across S. and middle U. S.: Nov. 26-Dec. 25. Parts of S. Canada during Dec. (certain species.)
1937 30 days in each of seven zones.	N. Alaska: Sept. 1-30. N. Canada: Sept. 1-Oct. 31.	S. Alaska and Alaska Pen.: Sept. 16-Oct. 15. Zone across middle U. S.: Oct. 9-Nov. 7. Most of middle Canada: Oct. into Nov.	W. Aleutians: Nov. 1-30. Zone across middle and northern U. S. Nov. 1-30. S. Provinces of Canada: most of Oct. and Nov.	Zone across S. States: Nov. 27-Dec. 26. B. C. (parts): Oct. 30-Jan. 2 (brant and snow geese to Feb. 18.)
1938 45 days in each of seven zones.	N. Alaska: Sept 1-Oct. 15. S. Alaska: Sept. 16-Oct. 30. N. Canada: Sept. 1-Oct. 31.	S. Alaska: Sept. 16-Oct. 30. N. E. and some border States: Oct. 1-Nov. 14. N. Canada (part): October 1-Nov. 15.	Alaska Pen.: Nov. 1-Dec. 15. Zone across U. S., Mass. to Calif.: Oct. 15-Nov. 28. Middle and S. Canada: Sept. 15-Nov. 15.	Zone across U. S., Va. and Fla. to Ariz.: Nov. 15-Dec. 29. S. B. C. (parts): Nov. 15-Jan. 14 (brant and snow geese, Dec. 17-Feb. 16.)

leads to this conclusion seems inadequate. It is believed that further study of this matter should be carried on. It would seem that, under the power granted the Secretary of Agriculture under Section 3 of the Migratory Bird Treaty Act, that he is empowered to demand from each hunter a statement of his kill, in order to be in position to judge whether any hunting whatever is admissible. This ascertained, a more accurate estimate of the relative abundance of the birds can be made by banding studies than by any other method. No business activity can be carried on without knowledge of the extent of its resources. A few of the States now request a statement of the kill of various species, and at least one makes this a requirement for continued permission to shoot.

The illegal kill, despite frequent assurances that a fine spirit of cooperation comes from the gunner, continues to be a factor of the utmost seriousness. This is evident from the frequent announcement of convictions for violation of regulations. It is reasonable to assume that each victory for the Survey is more than matched by instances where guilty persons have escaped conviction, not to mention cases where they escaped apprehension. Occasionally persons of presumed probity are convicted of infractions, and the Bureau must continually combat efforts of persons of influence to nullify the regulations. Such efforts merit the heartiest contempt, as they are vastly more destructive than the acts of the mere gunner who kills illegally a few waterfowl and who must pay the penalty.

Reference to Table 1 (in which many details are omitted) shows that, while from 1935 to 1937 only thirty days continuous shooting was allowed in any one locality (this increased in 1938 to forty-five days) migratory waterfowl raised in northern Canada or Alaska, and wintering in our southern states, were subjected to shooting for nearly or quite four months. The fifteen days added in 1938 to the prevalent thirty-day season gave to the shooters in each zone an additional advantage as regards weather fluctuations, which in a shorter period, because of local retardation or acceleration of migratory movements, might react to the advantage of the birds. A probable example of increased kill from this cause occurred in Wisconsin, whose duck kill in 1938 was 1,609,589, compared with 632,088 in 1937, and whose goose kill jumped from 1120 in 1937 to 6686 in 1938.

Diseases still take a heavy but an unknown toll. Despite the praiseworthy efforts to ascertain and guard against the destruction of waterfowl by botulism, severe losses continue. This is the fault of no one, but is, nevertheless, a matter that seriously diminishes the supply of waterfowl. It is therefore, a factor to be considered in determining seasons and bag-limits. During the past year severe losses have occurred on several of our major refuges in the West.

Lead poisoning, the result of the ingestion of spent shot picked up by waterfowl and other marsh-frequenting birds that mistake it for gravel, is a source of loss that is undoubtedly increasing in severity. It is by no means a new danger. Even forty years ago, long periods of concentrated shooting on some of our eastern marshes had resulted in such an accumulation of shot in the mud that it was not unusual to find from one to several grains of shot in the crops or gizzards of forty or fifty per cent of the day's bag of birds. Still, it is only in comparatively recent years that this man-made malady has come to be considered as a serious factor, and in spite of the fact that lead is bound to be cumulative in its effects, it seems now to be considered of relatively little importance. Both in the United States and Canada, however, as shown elsewhere in this issue, it is known to increase greatly the hazard to the continued existence of our vanishing trumpeter swan. (See p. 400.)

We consider the presence of this disease a sufficient reason for abolishing all shooting grounds on or near refuges. We have seen such concessions justified on the grounds that shooting grounds are inviolate sanctuaries most of the year. Yet, obviously, no place where shot is poured into a marsh year after year, to be picked up by birds to their certain death, can be considered a sanctuary at any time.

It is difficult to find any real justification for the liberalization of the bag-limit on geese in 1937 and 1938, especially in view of the raising of the possession limit in 1938. Certain circumstances indicate that the supposed large increase in geese was non-existent, but, even had the increase been real, it would better have been applied to breeding stock. And when translated into an increased possession limit this action is particularly dangerous, as it might well result, under some circumstances, in daily bag-limits of ten geese being taken.

Such ducks as have successfully run the gauntlet of shooting from Alaska and Canada to our southern border, and have gone on to northern Mexico, no longer find rest there. Until recent years Mexico was a relatively safe wintering ground because of its small amount of sport shooting, and because Mexicans who kill for food seldom buy ammunition for small game.

With the decline in waterfowl numbers in the United

TABLE 2.—WATERFOWL SPECIES GIVEN TOTAL PROTECTION (SHOWN BY X), 1935—1938

	Ross Goose	Eastern Brant	Eastern Snow Goose	Wood Duck	Canvas-back	Redhead	Ruddy	Buffle-head	Trumpeter Swan	Whistling Swan
1935	X		X	X			X	X	X	X
1936	X	X	X	X	X	X	X	X	X	X
1937	X	X	X	X	X	X	X	X	X	X
1938	X	X	X	X					X	X

States, the will to take advantage of the facilities for following the birds into Mexico seems to increase. To satisfy this demand, the business of selling these privileges has been organized, as by a certain sportsman's club with headquarters at Mexicali, and with branch offices at San Diego, Los Angeles, and Calexico. Its official announcement promises the following privileges: The club offers to obtain permits for shooting, entering through customs guns and ammunition, and bringing back into the United States the game limits authorized by the United States regulations—all these permits being good during the season legal in Mexico—in the case of ducks and geese from November 16 to March 15. Hunting licenses are said to serve as customs clearance during any one hunting trip, at weekly intervals, for thirty quail, twenty ducks, fifteen doves and two deer.

TABLE 3.—WATERFOWL BAG AND POSSESSION LIMITS, 1935—1938

	Bag Limits	Possession Limits
1935	Ducks 10 Geese 4	Ducks 10 Geese 4
1936	Ducks 10 Geese 4	Ducks 10 Geese 4
1937	Ducks 10 Geese 5	Ducks 10 Geese 5
1938	Ducks 10 Geese 5	Ducks 20 Geese 10

As a slight increase was noted in the aggregate numbers of ducks, protection was withdrawn in 1938 from certain species that in 1936 and 1937 had been considered so seriously threatened as to merit total protection. We have never been convinced that the supply of birds justified this decreased protection, especially since fifteen days was at the same time added to the open season in seven zones, from Alaska to the Gulf. Was not this withdrawal of protection rather a concession to shooters who did not wish to be bothered to distinguish species? And in the case of the geese, now admitted to be fewer in numbers than in previous years, one cannot escape the conviction that the granting of a higher bag in 1937, and of both bag and possession limits in 1938, were serious mistakes. (Tables 2 and 3.)

Those who are anxious to see our waterfowl increase will look for a decided lowering of the bag-limit on geese, and will await with interest the production of any evidence that a forty-five season is justified, or that the duck supply now justifies continued shooting of the canvasback, redhead, ruddy and bufflehead ducks.

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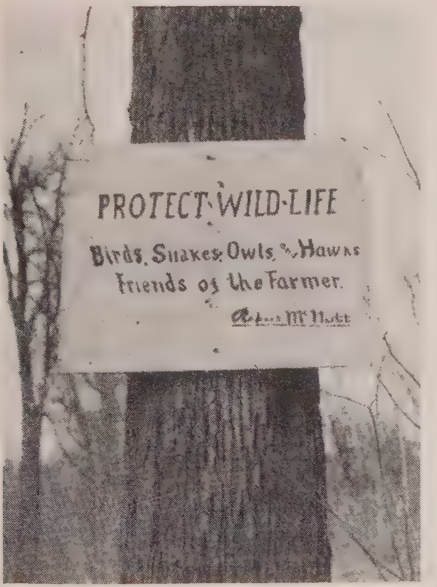
Things to Think About



An informed Illinois farmer, Robert McNutt, took the initiative and erected this sign on his property as his contribution to wildlife protection and conservation education. One of our members came across it while hiking near Quincy, Illinois. It was posted near the road, and Mr. McNutt's patch of timber land was left for Nature to manage, no cutting or clearing of underbrush and ground cover having been attempted.

In sending in this picture our member points out that "hawks and owls are generally shot in ignorance and because they make good targets. Hunters will always take a selfish interest in looking after some of the game in order to kill it the following year, but there is no closed season on any of the raptores, and nearly every farmer considers it a good deed to kill one. Here in Illinois, I believe, all are protected by law with the exception of five or six species. This, however, is of absolutely no value as not one hunter in a hundred knows the difference in the species and doesn't care. Also, the law is not enforced. I have read several accounts of the killing of eagles, which are protected. These stories appear in the local papers and the person doing the killing is regarded more or less as a hero and the fact that the law is violated is of no concern."

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Indication of the serious problem of maintaining and increasing our wildlife is to be found in the steadily increasing number of hunters. In 1938, for example, Wisconsin reports the largest number of licensed hunters in its history, with a total of 270,527 licenses issued. The State licensed 103,061 deer hunters last year. The Wisconsin Conservation Department announces that the reported game kill by these hunters during 1938 more than doubled that of the previous year. Tabulation showed a known kill of 4,495,846 as compared with 2,013,904 in 1937, giving an idea of the tremendous drain on the wildlife resources of the state. The rabbit kill jumped from 598,932 to 1,130,856; squirrels from 515,238 to 1,171,792; ducks from 632,088 to 1,609,589. The goose kill was six times that of 1937, jumping from 1120 to 6686.

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By Presidential proclamation Glacier Bay National Monument in southeastern Alaska has been more than doubled in size, being increased from 1820 square miles in area to 3850 square miles. This increase makes the Monument a greater sanctuary for native wildlife, particularly several species of Alaskan bears. The Alaska brown bear is the most common species in the area and the most in need of protection, being much sought by hunters. There are three species of grizzlies, the black bear is numerous, and the blue or glacier bear, which is found only on the glaciated coast of Alaska, also is found. Other animals in the Monument include the Sitka deer, mountain goat, wolf, coyote, wolverine, red fox, lynx, otter, weasel, marten and mink.

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Containing 54,538 acres of land nearly surrounded by water, the Aransas Migratory Waterfowl Refuge on the Texas coast is considered by the United States Biological Survey as one of the most important refuges in that area. It is a natural resting and breeding ground for thousands of migratory birds and other wildlife. Besides large numbers of ducks and geese, it also serves at various times during the year roseate spoonbills, reddish egrets, white-tailed kites, Audubon's caracaras, sandhill cranes and whooping cranes. The policy is to maintain the refuge in its natural state.

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Receipt of a pamphlet setting forth the objectives of the Texas Nature Federation moves us to urge Texas members of the American Nature Association and all readers of Nature Magazine to affiliate with one of the groups banded together in this federation. At the present writing there are ten active member clubs dedicated to constructive conservation work in the Lone Star State. Get in touch with Jerry E. Stillwell, 7460 San Benito Way, Dallas, Texas, for information about the organization in your vicinity. If there is none, enlist his help to remedy this situation and swell the ranks of Texas conservationists.

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A Federal refuge for the protection and perpetuation of the Pend Oreille, or Idaho, white-tailed deer and other forms of wildlife has been established in Stevens and Pend Oreille Counties, Washington. A total area of 65,000 acres in the refuge is planned.

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It is, of course, small solace that others are suffering from ailments similar to one's own, but a paragraph from a recent letter from the president of the Forest and Bird Protection Society of New Zealand is interesting in showing how widely man abuses Nature. He writes:

"The crux of all this kea and sheep farming business is that the sheep men are operating on high country which never should have been opened up for settlement. They are doing far greater harm to the well being of New Zealand simply because it is the custom annually to burn the tussock. Excessive floods and erosion are thus caused, to the grave detriment of the fertile lower lands. The authorities are alive to this matter and are resuming these high lands as the leases run out. Originally these mountain tops were covered with a wonderful resisting vegetation to water run-off, and the living and decaying tussock lay like a huge blanket in places five feet thick, forming a perfect check against rushing water. The blanket was burnt and the smoke therefrom turned day into night for weeks on end. Such are civilization's suicidal methods."

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Two recent bulletins of the Biological Survey deal with the menus of our diving ducks and our game ducks respectively. They are issued in the hope that they will aid in the provision of proper habitat for these besieged birds. *Food Habits of North American Diving Ducks* is by Clarence Cottam, and is available from the Superintendent of Documents, Washington, D. C., for thirty cents. *Food of Game Ducks in the United States and Canada,* by A. C. Martin and F. M. Uhler, is available from the same source for forty cents. Respectively these are Technical Bulletins Numbers 643 and 634.

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Exclusive of the area in the Adirondack and Catskill forest preserves in New York, acreage in State parks has increased eighty per cent since 1933, according to information from the United States Department of the Interior. Much of this Secretary Ickes credits to the cooperation between the Federal and State governments through the National Park Service. It is hoped that the increase in these areas for recreational purposes will relieve the demand upon the great National Parks and permit their preservation in the largely primeval state originally intended for them.

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It is no wonder that those working for the preservation of some of our forms of wildlife that are perilously near extinction become discouraged when they see such articles as that entitled "Stalking America's Mightiest Bird," featured in a recent issue of *Travel.* The article deals with the California condor. A mere corporal's guard, relatively, of these birds still remain in the United States, yet this article is devoted to glorifying the thrill of collecting their eggs in lower California. After some stiff climbing the author found a nest cave, and, in his story, observes: "I regretted that I had not brought my rifle, for the small shotgun I carried was of little use, and the skins of the condors would have been worth at least $150, and probably $200 each." He did, however, succeed in robbing them of a "thousand-dollar egg."

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Reprints of the excellent analysis of "Ducks Unlimited" by Ellsworth D. Lumley, originally printed in *The Seattle Wren,* are available for a three-cent postage stamp from Roy Hastings, 4442 48th Avenue, Seattle, Washington. It's worth sending for.

Vanishing Glory?

By
JOHN
LINDSEY
BLACKFORD

Closed season on snow geese in the Red Rocks-Yellowstone area urged to aid protection of the trumpeter swan

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Photographs by U. S. Bureau of Biological Survey

HIGH among the ranges of the Rockies, verdant beneath the snow-crowned peaks of the Centennials, gemmed and bejeweled with shimmering lakes, lies the valley of a last refuge, the vale of a final tarrying. For it is at Red Rock Lakes Migratory Waterfowl Refuge, new scenic super-sanctuary of the federal government in southwestern Montana, created primarily for the protection of our threatened trumpeter swan, and in nearby Yellowstone Park, that this largest and most gracious of all North American wild fowl makes its courageous last stand within our borders.

There we find hope that the trumpeter swan—whose high white legions once thronged the skyways, whose resonant voices once proclaimed the ebb and flood of New World migration—may survive. And, in its survival, we may hope that its snowy chevrons will signalize America's new vision, her new conception of a priceless natural heritage.

When one visits the scenic Centennials it is to hear of colorful pioneer history, to meet rare and interesting forms of bird life, and to behold varied and unrivaled natural beauties. Such a visit is an outdoor experience of rare value.

A RED ROCKS SWAN
One of the pitifully small remnant of these birds still found in the United States

Early freighters piloting their ox-drawn supply trains between Corrine, Utah, and Butte, Montana, and to the gold camps, gave Red Rock Creek its name. It was suggested by the red earth and rock formation south of Dell, Montana, and the name followed the stream to the lakes above and to the water's source. Latter-day explorers and scientists, seeking to discover the farthermost source of the Mississippi, came at last to this remote lakeland, and determined that the Red Rock drainage supplies the Gulf's most distant waters.

Lying at an elevation of seven thousand feet, the Centennial Valley is best reached from the Dillon-Idaho Falls highway. A fair-weather road exists, connecting it with the Henry Lake district of Idaho, and from there over beautiful Targhee Pass, and through the Targhee National Forest one arrives at West Yellowstone.

Claimed to be the most scenic of our federal wildlife refuges, Red Rock presents a memorable panorama of mountain grandeur and lakeland loveliness. Vaulting skyward to form a southern rampart for this valley of the last refuge, the crests of the Centennials first command the eye. In late July, when we drove over the pass, numerous snowbanks still lined the road, while in hidden cirque and sheltered gorge, or on favored northern exposure, gleamed broader fields of white.

The valley is truly garden-like. For long reaches, aspens belt the shores of Upper Red Rock; here, and farther on, spired evergreens join with them to form the verdant girdle of the lake. Beyond the open upland that lies between lake and mountain stand other woods of aspen, a virescent border at the base of the Centennials. Conifers mingle with them in those verdant sylvan groves, fingers of the grassy upland reach up into the dark green mantle of the hills, while the evergreens ascend the mountain flanks to the cragged heights.

To the north, grass-carpeted, symmetrically-moulded hills rise from the watery valley floor, and back of them, bluely outlined, the sharp, serrate skyline of the Gravellies.

Lower Red Rock Lake presents a picture so dreamlike as almost to cause one to escape, unknowing, the sense of reality. At the sedgy shoreline one looks across to the high, dark green wall of the tules, and here and there a waterway opening beyond gives hint of wider sweeps of lake. Only from an eminence is its entire beauty revealed. The tule wall marks not the farther shore, but only the first of many long and narrow reedy islands. Isle lies beyond isle; channel beyond shining channel mirror the intense blue of the sky, or reflect the coral clouds of evening.

Red Rock Lakes Migratory Waterfowl Refuge, comprising "the most

LOWER RED ROCK LAKE IN THE RED ROCK LAKES REFUGE

"Only from an eminence is its entire beauty revealed. The tule wall marks not the farther shore, but only the first of many long and narrow reedy islands. Isle lies beyond isle, channel beyond shining channel . . ."

important single nesting ground of the trumpeter swan in the United States," was established by Executive order of April 23, 1935, in no small measure a tribute to the vision and championship of the late George Wright. It now contains 27,555 acres, and while it is of particular value to the swans, more than 200 other species of birds, including many nesting ducks, make use of the sanctuary. The reserve is not only strategically located upon the flyways of the vast western interior, but is suited by natural fitness for such a site. An ample water supply does not diminish greatly even in the driest years, and a small dam in the watercourse leading from the lower lake maintains a fairly constant water level. The depth of the upper body of water varies from six inches to seven feet; that of Lower Red Rock is more ideal for the purposes of the refuge, its average depth over an area of several thousand acres being about fourteen inches. Swan Lake, adjoining the upper basin, is the shallowest of the three lakes.

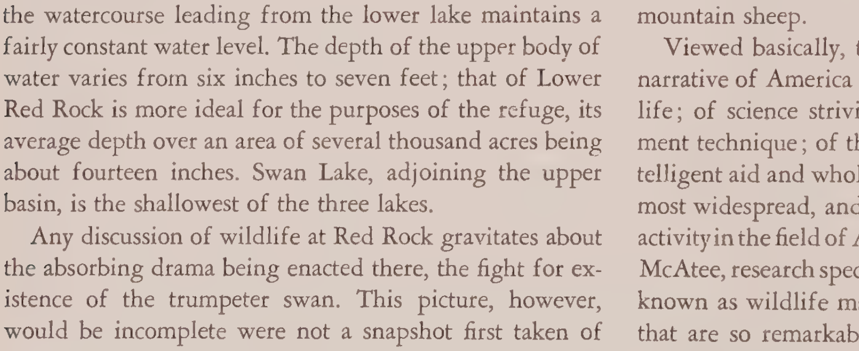
Any discussion of wildlife at Red Rock gravitates about the absorbing drama being enacted there, the fight for existence of the trumpeter swan. This picture, however, would be incomplete were not a snapshot first taken of other life at the sanctuary, and a brief sketch given of Archie Hull, its able and enthusiastic administrator, the man largely entrusted with giving back to bird life and to bird lovers of America the most majestic species of the North American wild.

Red Rock has as many nesting species of waterfowl as any refuge in the United States. During the fall of 1936 it was estimated that 200,000 ducks were using the water and marsh areas. "Hundreds of sandhill and little brown cranes migrated through the region, and twenty-five pairs of the former were noted nesting about the lakes. Long-billed curlews, avocets, and western willets nest there, and sage hens, Columbian sharp-tailed and ruffed grouse inhabit the upland," says the official report. In 1937, 15,000 to 20,000 ducks were produced on the reserve, and at the end of June approximately 150,000 were concentrated here during the moulting period. Moose find a large tract at the head of the upper lake well adapted to their needs, and a recent addition to the reserve is especially suited to mountain sheep.

Viewed basically, the story of Red Rock Refuge is the narrative of America awakening to the passing of its wildlife; of science striving for the perfecting of a management technique; of the response the wild is making to intelligent aid and whole-hearted protection. "The livest, the most widespread, and perhaps the most socially significant activity in the field of American biology today," writes W. L. McAtee, research specialist of the Survey, "is the technology known as wildlife management." It is these many factors that are so remarkably well typified at Red Rock in the person of A. V. Hull, its first and present manager.

Prior to his eleven years in the Survey, Mr. Hull did notable work in the field of ornithology. He is now collaborating with Clarence Cottam, chief of the Division of Food Habits Research of the Biological Survey, who in conjunction with the University of Utah and the Bureau is producing a state list, *The Birds of Utah.*

During his first years with the Survey, A. V. Hull was field assistant, and then game management agent, at the Bear River Migratory Waterfowl Refuge. Coming to Montana four years ago, his first task was to carry into effect the authorization of the Red Rock Refuge. In that



HEADQUARTERS AT RED ROCK

Here Archie Hull, manager of the refuge, directs the work of protecting the swans and the other bird inhabitants

A MOTHER BIRD SUSPECTS THE PRESENCE OF AN INTRUDER

This picture shows well the growth of tules that make up the reedy islands and provide an ideal spot for the nesting of many migratory waterfowl on this important refuge area

brief space the sanctuary has emerged from various public and private holdings, has been welded into an operating unit, and its wildlife management has begun. At Lakeview, midway of the refuge, service buildings have been constructed, a residence, steel lookout tower, and boathouse have been built. Miles of fencing protect the denizens of the preserve. Posting, dam rebuilding, bridges, roads, trails, and a telephone line have been carried to completion or are going rapidly forward. Special measures have been devised to promote the increase of rare and vanishing species, including the trumpeter swan.

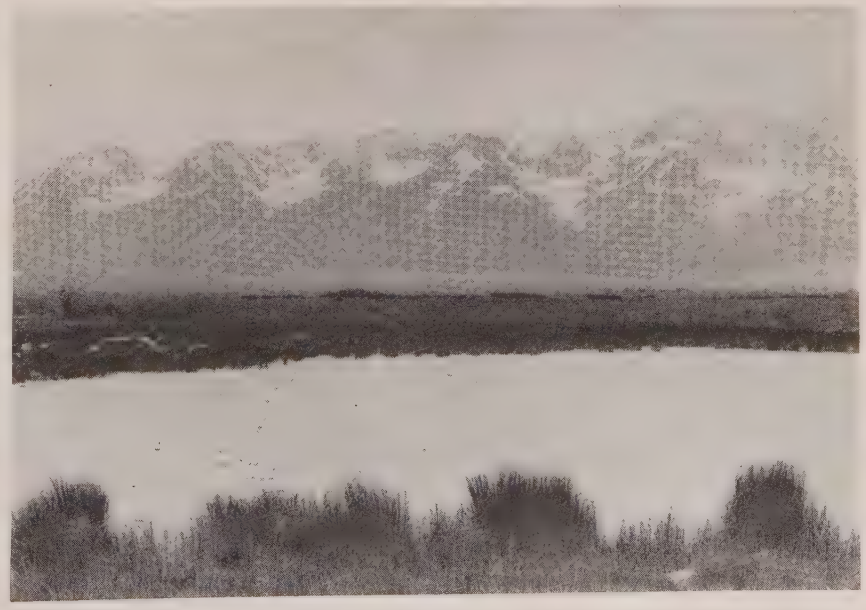
It is the tragic story of this largest of North American waterfowl—one that may yet have a happy ending—that has become the epic of Red Rock. Will it continue, we wonder, to be a story of vanishing glory?

"Exterminated by gunfire!" Thus W. L. Dawson voiced the consensus of opinion respecting the diminution of the great bird whose former range occupied the larger portion of the continent.

Affording a partial index to the gradual decrease of swans (both species being included) we learn from Preble (North American Fauna No. 27) on MacFarlane's authority that the Hudson's Bay Company sold between 1853 and 1877 a total of 17,671 swan skins. The annual sales gradually decreased from 1312 in 1854 to 122 in 1877. These numbers, taken to supply the demand for swan's down, and collected over the northern half of the continent, are more important as a measure of general decline in numbers than as a cause of diminution. "Wherever, in settled regions," wrote Edward A. Forbush, "swans were seen to alight, every kind of a firearm that could do duty was requisitioned, and all turned out to hunt the great white birds." Indeed, from early historical accounts, we find that many swan skins were taken at Red Rock itself. Yet today, the range of the larger of the two species in this country is restricted to northwestern Wyoming and southwestern Montana, and to the Henry Lake District in Idaho, which lies between. And it is only within a few years that it was definitely learned that a remnant still bred in this region.

No other trumpeter swans exist, save a last surviving company in the rugged wilderness of Canada's westernmost province. Through the courtesy of J. A. Munro, Chief Federal Migratory Bird Officer for British Columbia, the following statement regarding their present status has been prepared for this article, and by the permission of F. H. H. Williamson, Controller, Department of Mines and Resources, Lands, Parks and Forests Branch, Ottawa, is here included:

"According to the best information available the number of trumpeter swans in British Columbia is in excess of five hundred birds. This estimate is based on the annual enumeration of wintering bands which assemble on certain waters situated both on the coast region and in the central interior. In the latter district, where winter conditions usually include periods of sub-zero temperature,



CENTENNIAL MOUNTAINS ENCIRCLE THE REFUGE

In addition to the importance of the refuge, the Red Rock region is one of surpassing scenic beauty the feeding grounds are restricted to limited areas on certain rivers where a swift current prevents the water from freezing. Elsewhere the birds usually have a wide choice and their feeding grounds may include several different lakes. The more important wintering grounds are guarded by Assistant Migratory Bird Wardens appointed by the Canadian Government. The duty of these officers includes the feeding of swans when this is rendered necessary by severe weather conditions. Barley is the grain chiefly used for winter feed.

"Losses in trumpeter swan populations are mostly due to lead poisoning and to starvation. Loss through shooting has been reduced to a minimum in recent years.

"As most of the wintering bands under observation contain sufficient cygnets to insure the perpetuation of these populations the future of the species would seem to be reasonably secure so long as adequate protection is afforded."

In 1937 trumpeters in the United States were known to have numbered 158 birds, an increase of 43, more than 37 per cent, from the year before. The 1938 census reveals a decline to 148 individuals, despite the large number of cygnets produced this same year at Red Rock, indicating that over-optimism is not warranted and that only rigid protection will save the species.

FLOATING SAFELY

Four swans, for the better protection of which the author urges a closed season on snow geese in the area

The methods employed at Red Rock Lakes to assist increase are interesting. Twenty-four artificial nesting islands were first constructed and anchored in place to encourage the swans to nest in places where they could best be protected. The natural structure is usually a huge, often half-floating "haycock" of dry tule stems. Taking his cue from the birds, Archie Hull had truckloads of tules dumped at favorable locations on the ice. With its melting the tule mounds became partially submerged. Whether or not suggestion plays a part in swan psychology, the results have been unusually satisfactory.

"From the time the ice leaves the lakes until the first of August, when the young birds are fairly grown," reported Mr. Hull to the Survey, "I do not permit anyone to venture on the lakes where the swans nest. I do not go on the nesting ground myself, fearing the sun's rays may injure the embryo within the uncovered eggs; also for fear that an overcast sky or storm may chill them before the swans return to the nest. I am sure nothing gladdens our hearts more than to know that the trumpeter swans here are at least holding their own."

That skillful management at Red Rock has not only enabled the birds to maintain their numbers, but materially to increase them, is demonstrated by reference to the swan census figures. The figures for 1935 apparently represent the nesting population after the young were hatched. The records, including the 1938 nesting, show:

1935—Red Rock Lakes Refuge, cygnets and adults 47.

1936—Red Rock Lakes Refuge, cygnets 26, adults 31, total 57. Yellowstone Park, cygnets 13, adults 38, total 51.

1937—Red Rock Lakes Refuge, cygnets 51, adults 34, total 85. Yellowstone Park, cygnets 26, adults 42, total 68.

1938—Red Rock Lakes Refuge, cygnets 51, adults 46, total 97. Yellowstone Park, cygnets 4, adults 47, total 51.

Total in United States:

1937 (including 5 in adjacent areas)	158
1938	148

"What are the menaces to swan recovery and your suggestions for their solution?" I inquired of Archie Hull.

"Lack of knowledge on the part of persons who occasionally kill them outside of Red Rock Refuge and Yellowstone Park constitutes a serious problem," he replied. "There is no question but what some are killed each year in the Yellowstone region." Dissemination of information within the trumpeter's present range may overcome this grave menace.

"Disturbance by humans on the wintering grounds (a section still remaining in private hands) is a vital factor, since if they are driven from what little water they do have they may alight in the soft snow some distance from water and not be able to get again into the air. By beating their wings into the snow as they try to rise they may injure their flight feathers and be picked up by predators before they reach open water.

"Control of predators, particularly coyotes," he continued, "will aid recovery and assist in their perpetuation. Lead poisoning, especially on winter feeding grounds, is another serious factor. This can best be solved by the acquisition of additional lands where the swans winter, thereby keeping hunters from pouring lead into the water areas. Lack of sufficient winter food supply is an important question. It can be largely overcome by building up water areas where they winter, planting natural foods, and supplementing this by artificial feeding."

In explanation, it should be stated that between forty and fifty trumpeters move up each winter into the small open spring heads adjoining the east end of the refuge beyond the upper lakes. This area, an important part of the lands yet required to make of Red Rock an adequate sanctuary, is still under private control. The fact that its limited waters are the wintering area of the valley, and that hunting on them was continued, accounts for the fatalities there due to lead poisoning and molestation of birds, neither having occurred within the bounds of the reserve itself since its establishment. It not infrequently became the duty of Archie Hull and his assistants to rescue swans that, after taking off from the limited surface of the springs, had made an unhappy landing in the feathery snow. A temporary agreement to prohibit hunting on this section and remove the danger was secured last year; but it is obvious that until the actual acquisition of this and other vital holdings, now at issue in the courts, has been achieved, no certain prospect of recovery for this vanishing species is in sight.

"What factors affect increase, Mr. Hull?" I pursued.

"Briefly they are: (1) Protection against disturbance and predators on the nesting grounds, and while the young are growing; (2) construction of artificial nesting sites, imitating the original nests; (3) protection of cover; (4) constant water elevations; (5) planting natural foods."

"Muskrats are very helpful," volunteered the superintendent with a smile. "Swans often nest on top of the rat houses and by having more rats better nesting sites are provided."

Trumpeter swans did not breed, except rarely, as far north as did the whistling swans, and also did not go so far south, clinging rather precariously in winter to the northern limits of open water. The small remnant remaining apparently no longer answers this instinctive call, and in the areas described find not only a summer home but a winter habitat not too forbidding.

"Have there been other changes in trumpeter habits?" was my next query.

"As yet it is difficult to say," was the studied reply. "They seem to react best under the refuge system, as might be expected. Their increase since the establishment of the refuge demonstrates how quickly they have responded. For food the swans rely mainly on the tubers of one of the potomogetons, the sago pond weed."

"As you know, Mr. Hull, aside from certain differences in internal structure and a slightly larger size, the voice of the trumpeter is the principal distinction between it and the whistling swan," I said.

"Yes, one cannot be mistaken as to the identity of the two species after hearing their call notes. The trumpeter is well named. Its calls remind one of a sentinel blowing his bugle. Their sonorous bugle-like notes echo for miles over the refuge, especially in the spring. Young swans can always be told by their notes; they have higher pitched and more squeaky voices."

After securing a permit I went on the refuge, and, with inward excitement, anticipated sight of my first trumpeters. I had come to Red Rock to see, and, if possible, to study its swans; yet I knew, with marsh vegetation at its most luxuriant stage and the wary parent birds chaperoning their cygnets, I should be fortunate if I saw them well, although briefly, in the distance. Nevertheless, I could not have conceived for myself a more idyllic introduction to these noble birds than came to my lot on my first morning at Red Rock.

The earlier hours passed as I skirted the flat, sedge-grown shore-line of the lower lake. Soras called in the marsh; a willet graced a plashy pool; a Forster tern preened on a log. Having waded out a hundred yards in the reeds I stood with the water just short of spilling into my boots. It was there, intent upon horned grebes and other lesser waterfowl, that I became aware of a snowy flotilla drifting far to the left against the dark, vertical tule wall.

The swans! Bright white against the deep green of giant bulrushes, the tiny armada was transformed by the glasses to a pair with three large cygnets between, all gliding like fairy boats. Gradually the swans came on. How gracefully those alabaster necks curved down and beneath the blue surface! How effortlessly they rode the mirrored sheet. On they floated, so graceful-necked, a parent bird first, followed by two cygnets, slightly gray, then the other of the pair, snowy white, and the last cygnet close beside.

For an hour I stood in the same tracks. The swans, moving slowly along before that low, green, island wall, forsook it when opposite to me, and by nearly imperceptible degrees moved out until scarce half the width of that water lay between. I did not heed the wavelets that slipped over my boots, or the other marshland dwellers. I have seen swans since, and at other places than Red Rock, yet I do not think that in any setting I shall ever be so entranced.

"How do you account for the fact that many more cygnets are annually produced here than in the Park, although generally there are fewer adults at Red Rock than in the Yellowstone country?" I asked Mr. Hull one morning.

"That is an interesting sidelight on the birds here," replied the refuge manager. "Apparently the mated swans drive the non-breeding birds from these lakes when nesting begins. It is quite evident that unmated individuals are not wanted by the others at this season. Possibly it is because they make themselves more conspicuous and are likely to attract enemies; perhaps they are sources of interference and domestic discord. Swans have always been known at Red Rock and it would seem that this is their basic breeding area. The unpaired birds go over to Henry Lake or vacation in the Park, raising the adult swan count there."

"The voice of the trumpeter swan has a hornlike quality, very low in key," says Allan Brooks. "When a flock is passing overhead, the calls do not seem to be particularly loud, but long after, from miles away, the low resonant trumpet comes back clear and insistent. I do not think the clear whistling shout of the whistling swan will carry half the distance."

"They presented the most impressive spectacle in bird life ever seen in North America," stated Edward H. Forbush, describing avian migration. Above all the lesser migrant waterfowl, "higher still in the glowing firmament rode the long 'baseless triangles' of the swans, sweeping across the upper air in the exalted and unswerving flight, spanning a continent with the speed of the wind, their forms glistening like silver in the sunset glow."

With a lineage older than ours, with a beauty unrivalled by that of almost any other living form, the trumpeter's right to exist is inherently as fully justified as our own. Collectively we are doing all that administration, science, and alert technology can do to perpetuate their race. But as individuals, will our respect for wildlife and our self-restraint be such that success will reward these efforts?

It is definitely known that during one hunting season prior to the creation of the refuge several swans were killed either by design, or because they were confused with snow geese, the excuse commonly given by hunters. A quarter of the reserve, the portion embracing the lower lake, is at present open to waterfowl shooting in the fall, and special guards are on patrol there at that time. Cooperation too has been given by gun clubs here in disseminating information regarding the swans. In the wider region of their habitat, however, these conditions do not prevail.

The outstanding fact remains, however, that in 1938, despite the addition of fifty-five young, the total number of this species in the United States fell from 158 to 148. Wildlife counts cannot be entirely accurate but they afford a close index. Without doubt a vitally important percentage of the pitifully few remaining are killed each year by persons ignorant of the identity of the birds or wantonly disregardful of the situation. So long as there continues to be an open season on snow geese in this comparatively small area, that fact will serve as an escape, or at least as a mitigating circumstance, in the case of those guilty of the destruction of swans. The position of this elegant species is too precarious to warrant delay. Education is needed, but education is lamentably slow—too slow.

A great effort and a great expenditure are being made in the development of the refuge program. The success of what would unquestionably be one of its crowning accomplishments must not be jeopardized by irresponsible persons. Any one with the slightest appreciation of the values involved might reasonably be expected to refrain from any act that might possibly bring danger to the species. Unfortunately this is not the case. It is therefore the considered opinion of this writer that a closed season upon snow geese should be declared by the proper agencies throughout the Red Rock—Henry Lake—Yellowstone area, and that it should be kept in force there over whatever length of time may be required for the swans to pass this most critical stage in their recovery.

It is not the "swan-song", the death-song of the trumpeters, that we would hear, it is those living, far-carrying voices from the skyways to which we would listen. When their mighty snow-white pinions again go winging down the flyways of America, when their trumpet voices come back to us again long after their passing, we shall realize more fully than now that none could replace them. When once more we behold them, traversing like angel squadrons the vast, uppermost lanes of the sky, we shall know how empty that blue vault would have been without them. Let us resolve that Red Rock and their few other last refuges shall not be merely the scenes of a final tarrying, but truly the road of their glorious return.

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Blue Geese Nesting in Manitoba *By* MYRTLE J. BROLEY

FOR THE first time, to our knowledge, a pair of blue geese have remained to nest in Manitoba. As far as we can learn this is a first record for Manitoba, and quite possibly the only time this has happened in Southern Canada.

Huge flocks of blue and snow geese rested for about three weeks at the Gebauer Sanctuary on their long journey to their Arctic nesting-grounds. On the fields they looked like drifted snow, and the beating of their wings when they flew around and alighted on the ponds was deafening.

By thousands, then hundreds, finally a dozen or so at a time, they left to make the long flight to Baffinland. At last all but four were gone. Of these a pair of blues have nested. They are still very wild, flying off and away when anyone approaches the nest. Only by hiding in a blind was it possible to get the picture.

A BLUE GOOSE ON THE NEST

Finding the Gebauer Sanctuary in Southern Manitoba hospitable, it did not fly north

This sanctuary, which was described in the September, 1937, NATURE MAGAZINE, is in a flourishing condition. When we visited it on the fifth of June there were many little families of wild ducklings. A snow and a blue goose that had mated were proudly leading about three dark little goslings. The broods of three pairs of Canada geese, four of blue geese, and many of ducks were still to be hatched. Perhaps the blues recognized this as a good safe place to stay and thought it foolish to fly away to Baffinland when they could nest in comfort and security here.

Ebbie—A Personable Crow

By GRACE ERNESTINE RAY

TRAINING a crow to talk is the hobby of Roy Freeman Ward, Eagle Boy Scout of Wellston, Oklahoma. Ebbie is the name of this ordinary ebony crow, which was found wandering alone in a field soon after he was hatched. Roy Freeman fed him and saved his life, and Ebbie repays this by pecking Roy's opponents in boys' scraps.

"Go way!" is the bird's favorite exclamation. As he is a meddlesome creature, he has heard these words addressed to him often enough to learn them. "Oh boy," "Hello, there," "Ebbie," "I won't," and "Joe" are other words in the crow's vocabulary. Although Ebbie began to talk when two months old, he would not feed himself, and he still goes to Roy Freeman with his mouth open when hungry, but this may be temperament, not dumbness.

Ebbie likes hamburger, washed down with milk. His strongest drink is Dr. Pepper. "Ah heck!" is his strongest expletive, and Roy Freeman hopes Ebbie won't take up swearing and smoking. However, the bird lifted a package of cigarets from dad's pocket the other day, flew to the roof, and took them all apart. He likes to strike matches. Once he accidentally set the yard on fire. Realizing danger, he didn't stop to talk, but lifted his voice in the loud "Caw! Caw!" warning of the wild crow in the woods, and alarmed the family.

"Crows are among the most intelligent birds and learn to do things that most birds can't do," says Dr. Aute Richards, zoology professor at the University of Oklahoma.

Ebbie persisted in roosting in a tree by the bedroom window and waking the family at dawn. Turning the water hose on him was the only way to drive him from this tree, but now Ebbie obeys when Roy Freeman merely shows him the nozzle of the hose as a gentle warning.

No doubt about it, Ebbie has personality. He chases stray chickens and dogs out of the yard, laughs loudly when others laugh, sits on Roy Freeman's bicycle and rides about town, and struts his ruffled feathers when telling intruders to go away. He peers into the French horn on the bicycle as if trying to see how to operate it.

Ebbie is the bosom friend of Joe, a Llewellyn setter. The pup was almost "done to death" by fleas before Roy Freeman realized it, but Ebbie stepped in and ate up all the fleas.

Ebbie is allowed his complete freedom but he has never shown any desire to leave Roy Freeman.

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"Two Temples"

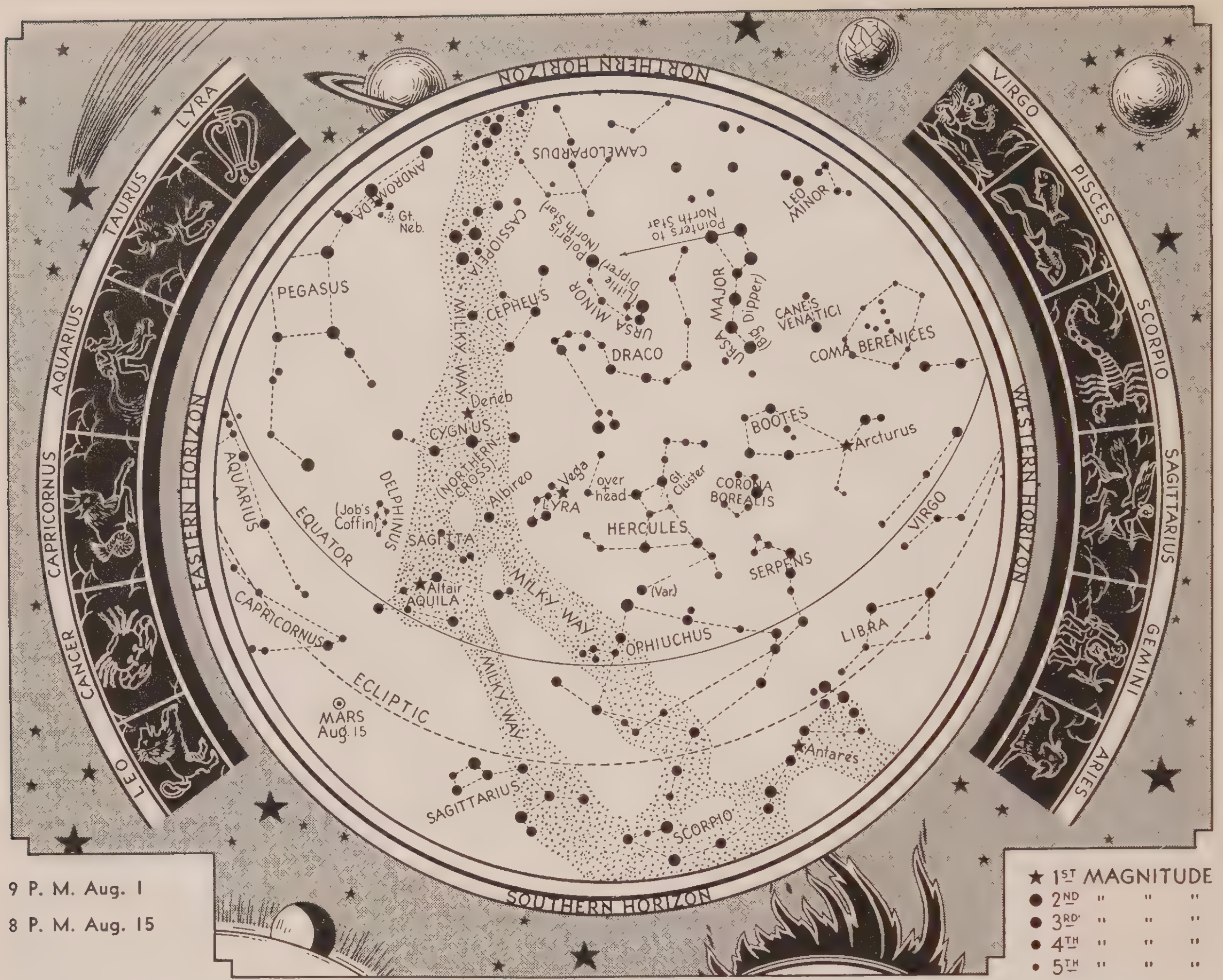
By GRETA GRATZ

A Vision once came to the heart of a man—
A builder in marble and stone.
"Let me dwell in your soul and grow by your hand
A temple to God through the labor of man?"

Years passed and the builder in service, low-bent
Beheld his work . . . and died content!

Traced were its archways, lovely its line,
Pillared in granite, lace-spired, divine.
Yet those who prayed within its door
Heard God as He walked on the light-fretted floor,
Were soothed by His Presence in corridors dim;
Sensed, but knew not the nearness of Him!

A Vision grew in the heart of One,
A Builder in temples of Life . . .
"Let me dwell in your thought, be fashioned by thee;
A temple, transcendent, for humanity.
Where those who will worship, may understand,
Come talk and walk with Him close at hand,
Not builded of marble or gold or brass,
But with star-gemmed ceil
And a floor of grass,
O'er-patterned with flowers where you pass;
Where the song of bird, and swish of rain,
Whistle of wind and the waves' refrain
Make God a Being *we* understand,
Can talk and walk with Him, close at hand!"


NORTHERN HORIZON
SOUTHERN HORIZON
EASTERN HORIZON
WESTERN HORIZON
LYRA
TAURUS
AQUARIUS
CAPRICORNUS
CANCER
LEO
VIRGO
PISCES
SCORPIO
SAGITTARIUS
GEMINI
ARIES
CAMELOPARDUS
ANDROMEDA
Gt. Neb.
CASSIOPEIA
PEGASUS
CEPHEUS
Polaris (North Star)
URSA MINOR (Little Dipper)
Pointers to North Star
URSA MAJOR (Big Dipper)
LEO MINOR
CANES VENATICI
COMA BERENICES
DRACO
MILKY WAY
Deneb
CYGNUS (NORTHERN CROSS)
Albireo
Vega
LYRA
over head
Gt. Cluster
HERCULES
CORONA BOREALIS
BOOTES
Arcturus
VIRGO
AQUARIUS
EQUATOR
DELPHINUS
(Job's Coffin)
SAGITTA
Altair
AQUILA
CAPRICORNUS
(Var)
OPHIUCHUS
SERPENS
LIBRA
ECLIPTIC
MARS Aug. 15
SAGITTARIUS
SCORPIO
Antares
★ 1ST MAGNITUDE
● 2ND " " "
● 3RD " " "
● 4TH " " "
• 5TH " " "

9 P. M. Aug. 1

8 P. M. Aug. 15

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

THE AUGUST-SEPTEMBER SKIES

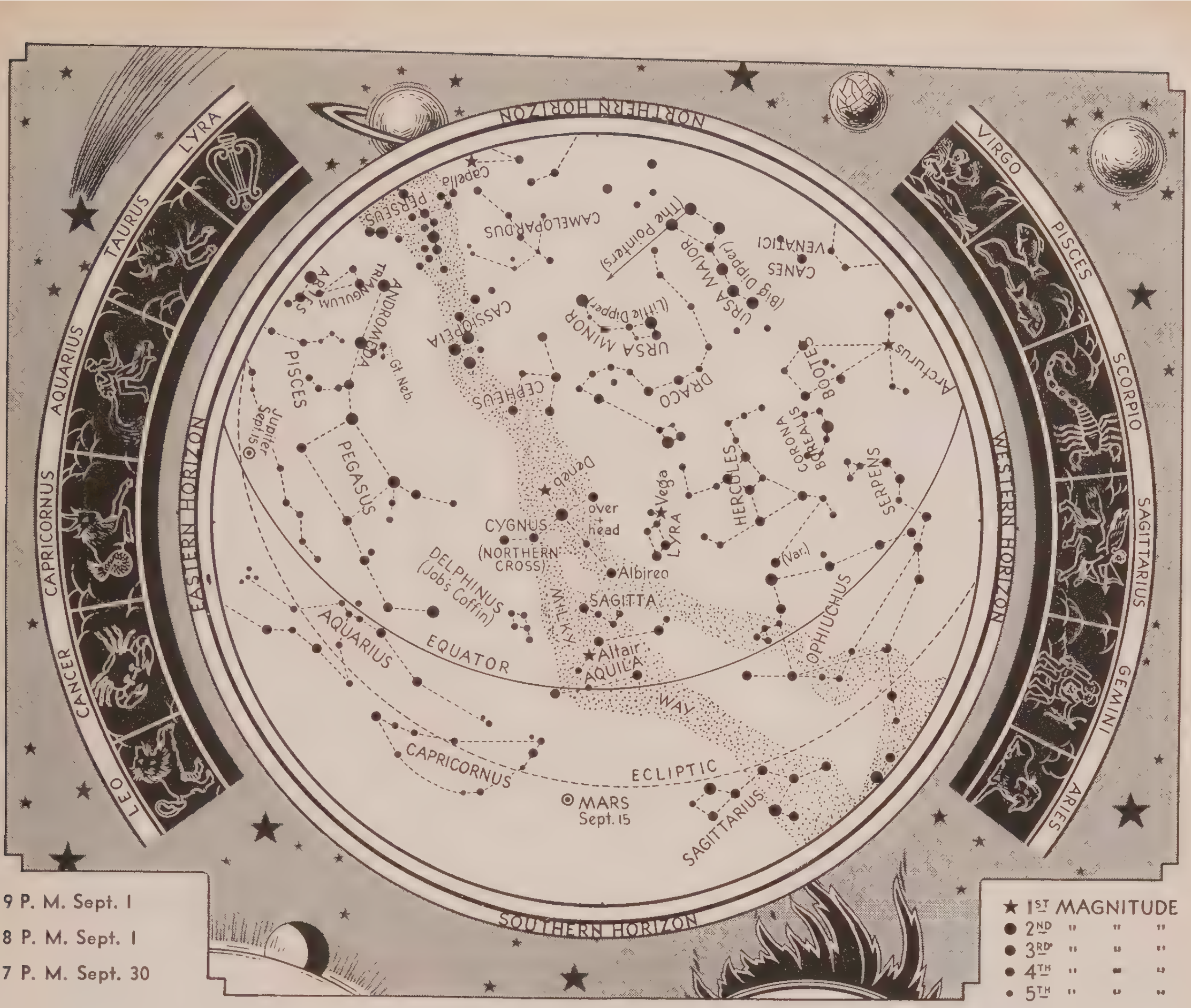
By ISABEL M. LEWIS

THE most interesting objects to observe in the evening skies in these two months will be the two planets Mars and Jupiter, both of which are now shining with exceptional splendor.

On July 27 Mars was closer to the earth than it has been since August, 1924, and closer than it will be again for fifteen or seventeen years. Although its distance from the earth is now slowly increasing it will continue to be remarkably brilliant, rivalled only by Jupiter in splendor. At the beginning of August Mars is slightly brighter than Jupiter. The ruddy planet will be seen then in the southeast, in Sagittarius, directly after sunset, and Jupiter will rise in the east in Pisces about two hours later. From August 11 to 13 the two planets will be exactly equal in brightness, and then Jupiter will increase slightly in brightness until the end of September, while Mars will drop noticeably in brightness during the same period. No stellar object visible in the evening sky during the two months, with the exception of Jupiter, will approach it in splendor, and its characteristic reddish color gives it a striking appearance. Since June 24 Mars has been retrograding, or moving westward, among the stars, but on August 24 it will again reach a stationary point relative to the stars and after that will resume its customary eastward motion.

Jupiter will remain in Pisces during these two months, and on September 27 it will be in opposition to the sun and visible all night. It happens that at this time Jupiter is near its perihelion, so this is the most favorable opposition of Jupiter for twelve years to come. Its distance from the earth at this opposition will be about 367,000,000 miles, which is 47,000,000 miles nearer than it was at the opposition of five years ago when it was in the part of its orbit farthest from the sun.

The planet Saturn also is now coming into the evening sky. Pale yellow in color, it is slightly less brilliant than Vega early in August, but increases slowly in brightness as it approaches opposition in the fall until it is the equal


NORTHERN HORIZON
LYRA
TAURUS
AQUARIUS
CAPRICORNUS
CANCER
LEO
VIRGO
PISCES
SCORPIO
SAGITTARIUS
GEMINI
ARIES
Capella
PERSEUS
CAMELOPARDUS
(The Pointers)
URSA MAJOR
(Big Dipper)
CANES VENATICI
ARIES
TRIANGULUM
ANDROMEDA
CASSIOPEIA
URSA MINOR
(Little Dipper)
Gt. Neb.
PISCES
DRACO
CEPHEUS
Arcturus
BOOTES
CORONA BOREALIS
Jupiter Sept. 15
EASTERN HORIZON
PEGASUS
Deneb
over head
Vega
LYRA
HERCULES
SERPENS
WESTERN HORIZON
CYGNUS
(NORTHERN CROSS)
Albireo
DELPHINUS
(Jobs Coffin)
MILKY WAY
SAGITTA
(Var.)
OPHIUCHUS
AQUARIUS
EQUATOR
Altair
AQUILA
CAPRICORNUS
ECLIPTIC
MARS
Sept. 15
SAGITTARIUS
SOUTHERN HORIZON
9 P. M. Sept. 1
8 P. M. Sept. 1
7 P. M. Sept. 30
★ 1st MAGNITUDE
● 2nd " "
● 3rd " "
● 4th " "
• 5th " "

of this brilliant star in splendor. It remains in the constellation of Pisces during the two months, and early in August rises shortly before midnight. By the end of September it is visible nearly all night.

Venus, which has been in the morning sky for many months, will be in superior conjunction with the sun on September 5. It will then pass to the evening sky, but it will be too close to the sun to be seen during these two months, except possibly for a short time low in the east before sunrise early in August, or low in the west after sunset late in September.

Mercury will be in inferior conjunction with the sun on August 10, but on August 28 it will be at greatest elongation west of the sun in the morning sky, and it will then rise about an hour and a half before the sun. This will be a favorable time to look for the planet in the east before sunrise. It will appear as bright, or brighter than, Arcturus or Vega, and it should be possible to find it in the morning twilight for a week or more before and after the date of its elongation.

The evening skies this year in the months of August and September should appear unusually attractive because of the presence of the two planets, Mars and Jupiter, which are both so exceptionally brilliant at this time, and, with Saturn appearing later in the evening, even a casual observer of the heavens will be attracted by their beauty.

The annual shower of meteors known as the Perseids, which has its maximum display each year, August 10-12, should be better than usual this year because there will be no moonlight to disturb the show. New moon will occur this year on August 14, and the waning crescent moon will not rise until the early morning hours on August 10-12. One should be able to see many members of this swarm late in the evening, or better, around midnight. The Perseids first appear late in July and continue in greater or less numbers even into September, with the richest display to be expected the second week in August. The Perseids are swiftly moving and a brilliant greenish color. As their name indicates their radiant lies in the constellation of Perseus, which appears above the northeastern horizon late in the evening at this time of year. There are, in addition to the Perseids, other swarms of meteors that appear during these two months, such as the Cygnids, the Lacertids, and the Draconids, and a watchful observer should be rewarded with a fair display of meteors on almost any clear dark night in August and, to a less degree, in September. It is well to remember, though, that to see meteors one must avoid not only moonlight but also the glare of city lights. Meteors, as well as the Milky Way, are best seen in the country or at sea, and, by the way, some of the most beautiful parts of the Milky Way are to be found in the constellations of Cygnus, Ophiuchus, Sagittarius, and Scorpio, now visible in the evening sky.

THE SCHOOL PAGE ★ ★ ★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

A Breathing Spell

August is a breathing spell for most school people when they are likely to do some of the things which they have wanted to do all along but lacked the necessary time. This page has repeatedly urged that Nature Study in the schools be a study of the real thing and not a vicarious experience. Since this is a breathing-spell article we are going to forget that philosophy completely for once and make some suggestions for profitable reading for the season.

The writer happens to live in central New York State on the famous Finger Lakes, which are a part of the old Erie Canal system. During the breathing spell, between the close of the spring session and the opening of the hectic season of summer school, he has had the time to do a little reading that he has wanted to do all along. The most interesting find of all was *Letters on the Natural History and Internal Resources of the State of New York* by Hibernicus, who really was DeWitt Clinton, former Governor of the State of New York.

It is interesting to check the present conditions in this settled part of our country with what they were in 1820, when the letters were written, and also to check the knowledge possessed by this man with that commonly possessed by those holding political positions in these days. Does anyone know of a modern governor who, in exploring a new territory, would write as did Clinton in 1820, "I was regaled with most excellent fish of the esox genus; and at Syracuse and Rome, on my way up, I had a fine salmon"? Again he says, "The Cayuga Lake abounds with fine fish, and among others, with the white fish, or salmo clupeaformis. . . . The salmo salar is also found here and at least four species of esox, or pike."

We like to think that our investigations of the migrations of fishes are relatively modern and yet the former Governor of New York writes in 1820, "The science of ichthyology is pregnant with instruction and amusement. The migration of fishes, their occasional appearance and absence, their habits, &c. are subjects of interesting inquiry. The most remarkable circumstance in their natural history is their extreme longevity and rapid growth. A salmon weighing 7¾ lbs. was taken on the 7th of February at Warrington (Eng.), and marked with scissors on the back fin and tail, and turned into the river, and was again taken on the 17th of the following March, and was then found to weigh 17½ lbs." Apparently they had some rather tall fish stories even in those days, but our writer goes on to discuss the salmons of Siberia, Europe and other parts of the world in a way no modern politician would think of doing. He even ventures into the quagmire of systematic ichthyology and tries to draw hard and fast lines defining the species of trouts, salmons and pikes.

An interesting note on economic ichthyology appears when Governor Clinton reports the sale in the Thousand Island region of the St. Lawrence River of 400 barrels of salmon at $14 a barrel, and of 1000 barrels of eels shipped from Oswego Falls at $10 a barrel.

Not only is our friend a student of fishes but we find him writing of birds, mammals, insects, trees and herbs. It is fun to read of his experiences at night at Geneva, New York, when he was told of a bird "which has never been seen. It is called the Stake Driver from the noise it makes, and is continually flying from tree to tree. It is undoubtedly a nocturnal bird of the Picus tribe". Here we find our early naturalist jumping to a wrong conclusion so far as our bitterns are concerned.

Another place in which our friend slipped was when he predicted that the markets of New York would, with the opening of the canal, be enriched by the addition of "the podophyllum peltatum . . . commonly called mandrake or May apple". He always refers to this central New York area as "the west" calling it "the finest wheat country in the world", expressing his conviction that coal must be found in the hills of the Finger Lakes and hoping that the opening of the canal will "provide a market for grain . . . and prevent its conversion into ardent spirits." "Whiskey," he says, "sells for eighteen cents a gallon", and goes on to say that because of this "a man may be kept constantly drunk for three or four shillings a week". "Nothing", he says, "but a heavy excise can banish the use of this deleterious poison."

Governor Clinton speaks of fine new steamers of 120 tons with 24 horsepower "engines" with which one can traverse canals costing $11,792 a mile at eight dollars for a four-day trip of 200 miles, "without a jolt, or the least fatigue, and employ the whole time in reading, writing, rational conversation, amusement, or viewing the most interesting region of the globe". These might be suggestions for an August vacation but it is doubtful if in our modern conveyances of which we are so proud one could go four days without a jolt.

The purpose of this article is not to induce our readers to see the Finger Lakes region (Editor's Note; I wonder) but to suggest that others spend the breathing spell that comes to us teachers at this time of year, if ever, in looking back to the accounts of what those who lived in our own backyards a century or so ago found there to interest them.

Look up something about the journeys of the Bartrams, the Rafinesques, the Says and the Michaux family, as well as try to know something of what Audubon and Wilson found on their journeys. Haunt the local library for early accounts of the county or write to the State Historical Society for help and suggestions. The libraries may be cooler and quieter than the local Coney Islands in August.

We may smile at some of the mistakes of these early naturalists but we will go a long way before we find modern people as cognizant of important things of their time as we find DeWitt Clinton, alias Hibernicus. As a matter of fact it is rather unique that erudition should be hidden behind a pseudonym rather than boasted of to all who will listen to us over the radio, read of us in the newspapers or see our pictures in the movies. It is a bit chastening to learn to know better some of these ancestors of ours whose names have appeared in the history books because of their political activities but whose genuine human interests have been overlooked by themselves or by those who chronicled their lives.

We find them evaluating the work of their predecessors just as we evaluate theirs. Clinton in one place writes from the "far west" at Canandaigua, New York, that a certain Dr. Robertson, who had claimed that the red man had tamed no wild animal, was decidedly mistaken. He mentions the domestication of the turkey, of guinea pigs in Peru and of the dog in America. And with the mention of the dog he is off again trying to decide whether a dog is a tame wolf or not, and basing his arguments on gestation periods and on experiments in Europe by the learned Buffon who tried unsuccessfully to mate wolves and dogs. How many modern public office holders would have a corresponding understanding of biological problems or interest in trying to solve them?

And while we are spending our breathing spell looking up the views of people who worked in our own localities we might, if we have the time, on that four-day joltless journey, look farther back into the work in our chosen field to see how men discovered the principles of geology, physics, chemistry and biology with which we so freely play in writing our science programs and lesson plans during the time of the year when we are on the job.

In recent years, there have been some excellent source books published for the different sciences giving us just the help we need for this sort of thing. A good example of this is *A Source Book in Geology* by Kirtley Mather and Shirley Mason, off the press in June and published by McGraw-Hill Book Company. Of a slightly different nature, but of considerable interest for reading during the "breathing spell", is *The Human Organism and the World of Life* by Clarence W. Young and others, published by Harper Brothers.

If these books, and those that have been reviewed in NATURE MAGAZINE, do not provide ample suggestions for profitable reading, then drop a card to each publisher for their suggestions as to what should be read. This should supply you with enough titles to fill a canal boat and choke DeWitt Clinton's canal. And if by any accident you should be in the "far west" of central New York during the breathing spell and wish to look up the author of this page you will probably find him going over much of the route of which Clinton wrote, seeing, if he can, what changes have taken place in the last 119 years. It promises to be almost as much fun as reading Clinton's notes.

P. S. And don't expect to catch any salmon in central New York.

The sixth in the series of educational inserts specially prepared for Nature Magazine by Dr. Palmer will appear in the October issue. It is devoted to a discussion of some common rocks and minerals.

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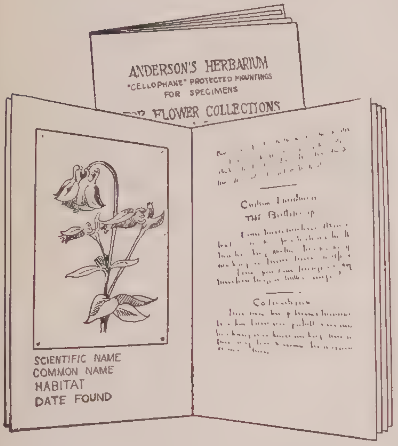

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Scientific Photography

The ninth annual convention of the Biological Photographic Association will be held at the Mellon Institute for Industrial Research, Pittsburgh, Pa., September 14 to 16. The program will be of interest to scientific photographers, scientists who use photography as an aid in their work, teachers in the biological fields, technical experts, and serious amateurs. Further information may be obtained from the Secretary of the Biological Photographic Association, University Office, Magee Hospital, Pittsburgh, Pa.

Photography Contest

A contest for Nature photographers is being conducted by the National Association of Audubon Societies, 1006 Fifth Avenue, New York City. There will be five cash awards, and the contest closes September 1. There is no limit on the number of entries, which will be judged on photographic merit rather than subject matter. The subjects may be anything in the animal kingdom. Send for rules of the contest to the Photography Editor of the Audubon Society.

Nature Photographs

One of the first activities of the newly-organized New York State Nature Association is a photographic exhibition confined to pictures of birds and mammals in their natural environments. Pictures entered must be mounted on standard 16 by 20-inch mounts in such a way that the long dimension of the mount is vertical; the name and address of the entrant must be typed or printed on the back. Awards of twenty, ten and five dollars will be awarded the three pictures judged best to represent the spirit and beauty of wild birds and mammals. The exhibition will be held in the galleries of the American Humane Association in Albany, New York, from October 16 to 29, and entries should be sent, not later than October 7, to Miss Alice Morgan Wright, 393 State Street, Albany, New York.

The World of Insects

This is the title that Carl D. Duncan and Gayle Pickwell, both professors at San Jose State Teachers College in California, give to a fine new book on insects. The information is presented in non-technical form and the book is packed concisely with interest and information. More than two hundred illustrations add to the value of this book. It should find great favor with students of entomology and for general reference. This volume is brought out by the McGraw-Hill Book Company at $3.50.

Growing Begonias

If you are a begonia enthusiast you will welcome *Begonias* by Bessie Buxton, the latest addition to the series of garden books being published by Hale, Cushman and Flint. Treating with some two hundred varieties of this interesting plant, this book gives practical information on cultivation indoors and outdoors. The price is one dollar.

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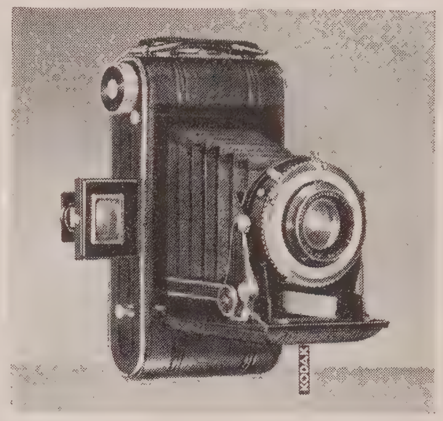

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NATURE IN PRINT

As a convenience to readers the books reviewed in this department of Nature Magazine may be ordered through the book department of the American Nature Association.

Comstock Handbook

The Handbook of Nature Study by Anna Botsford Comstock has just been published in its twenty-fourth edition by the Comstock Publishing Company, Ithaca, New York. Twenty-eight years ago when this classic of Nature literature was first published, Nature lovers, whether teachers or amateurs, had little printed material suitable to their needs. The worth of the material published in the original edition is just as great today even though the styles of dress appearing in the illustrations have changed. This new edition brings the original material up to date and enriches it both in text and illustrations. The material is indexed into current literature and a splendid bibliography is provided.

Mrs. Comstock's style has not been and probably will not be matched by other writers. Few books have been written which required less changing after nearly three decades than this book, but the publishers felt that the book's usefulness would be increased by new pictures, new format and revisions of certain sections, particularly those bearing on bibliography and earth science. The ability of the talent engaged in these revisions guarantees the reliability of the new material.

Dr. Marjorie Ross, who shouldered the major responsibility in the revision, recognized the desirability of introducing new ways of teaching and provided some splendid supplementary material.

The book retains the technique of providing lessons on particular kinds of things. One looks in vain in the index for sections dealing with such ecological groups as swamps, bogs, fields, woodlands, and the sea and lakes. The essential things in these types of country are however to be found. The book could have been improved by a more extensive treatment of material dealing with heat, light, gravity, electricity and the chemical and physical nature of matter. These are just as much within the field of Nature study as some of the other things considered. The increased size of the page would have permitted the use of larger illustrations than those used, and this might have been an improvement in a book that in all probability will be used by groups as well as by individuals.

It is doubtful if any book in this field combines accuracy of treatment, cleverness in style and wise selection of content as does this new edition of a standard book. The bibliography wisely integrates the book with current and acceptable literature and will in all probability be kept up to date with succeeding editions. No book in the field provides anything comparable with the rich and specific suggestions as to how certain things in natural science may be taught. There is enough new material to warrant the purchase of the book by those owning the older editions which are undoubtedly now worn out physically anyway. E. L. P.

About Nature Writers

Herbert Faulkner West, Professor of Comparative Literature at Dartmouth College, has performed a distinct and unique service in his book, *The Nature Writers*. Following a charming introduction, Dr. West lists Nature writers from George David Aiken, now Governor of Vermont, to Sir Francis Younghusband. Under each author's name appears reference to his outstanding works in the Nature field and brief and pointed comment on his contribution. No attempt has been made to include professional guide books, or ephemeral books, or Nature poetry, the latter compilation requiring a book by itself. Some 260 titles are mentioned. This valuable little book is published by the Stephen Daye Press at two dollars.

Wild Flower Book

Distinguished for its lovely color pictures of thirty-three popular wild flowers, grouped by seasons, *A Book of Wild Flowers*, by Margaret McKenny and Edith F. Johnson, should appeal to many flower lovers. Edith Johnson is the artist and the brief text is supplied by Miss McKenny. There is no attempt to make this book a guide to wild flowers, since appeal is to the eye and to sentiment. The only concession to the scientific approach is a list of the scientific names of the flowers pictured and described, this appearing at the end of the book. Beautifully printed, the little volume comes from the presses of Macmillan and sells for two dollars.

Making Plants Grow

Plant Growth-Substances is the title of a book by Hugh Nicol, British bacteriologist, dealing with the chemistry and application of substances that make plants grow and paying particular attention to synthetics. After two chapters for the layman, the text moves on into more advanced discussion of this subject. This volume is a useful addition to the scanty literature now available in a field of plant growth that departs from the usual. The book is published by the Chemical Publishing Company, 148 Lafayette Street, New York City, at two dollars.

Four Garden Books

From the presses of Hale, Cushman and Flint comes a quartet of valuable and inexpensive garden books that should delight many home owners. These are *Rock Gardens* by James H. Bissland and others; *The Vegetable Garden* by Edward I. Farrington; *The Lawn* by Charles W. Parker; *The Gardener's Almanac* by Edward I. Farrington. The latter volume carries the home gardener through the year with specific and practical suggestions about things to be done, month by month. The titles of the other three books are descriptive of their contents and they treat with their subject matter in a manner that will help the gardener to the highest success. These helpful volumes sell for one dollar each and are eminently worth the investment.

Letters to Strongheart

Strongheart, many will recall, was a beautiful German Shepherd dog whose appearance in several motion pictures distinguished those entertainments. He was a dog raised and trained with sympathetic understanding and in the conviction that the great inherent intelligence of dogs may thus be brought out. Strongheart has passed on to the "Eternal Playground Out Yonder" and it is to that address that J. Allen Boone writes his *Letters to Strongheart*. They are letters of philosophy, of people and places, written much as a man would talk to his dog knowing that he would receive attention, understanding silence and thus be able to organize and present his ideas without the interruption of another human ego. Here, in fact, is a book of the outdoors, of travel and of philosophy that is unique in idea. It is published, at $2.50, by Prentice-Hall.

Planning a Garden

If one is building a new home and planning the garden, or is seeking ideas for revision of one's present garden, he will find *Garden Planning and Building* by H. Stuart Ortloff and Henry B. Raymore a most helpful volume. This book is designed for the owner of the small home and presents simple plans both in general and in detail, combined with practical suggestions. Its authors are landscape architect and architect, respectively. This is another book in the Whittlesey House Garden Series and sells for three dollars.

For Young Entomologists

Youthful collectors find opportunity to satisfy their collecting instincts in many directions. One of these that has continued to be popular through the years has been in the field of insects. Boys with this interest will find a most helpful book to be *The Boy's Book of Insects* by Edwin Way Teale. The author not only supplies information on the various insect families but provides practical suggestions with respect to a collecting kit and the proper preservation of the specimens. The text is supplemented by some of Mr. Teale's fine pictures and by diagrams. The publishers are E. P. Dutton and Company and the price is two dollars.

Lure of the Desert

Deserts is the title of a beautiful and important book by Gayle Pickwell. Reproduced in a large format, with fine, large pictures, it is a story of our own western deserts (and semi-deserts), what they are and why they are, and of the plants and animals that find habitation in them. It is a book for the home and a volume that should be in every school library as a source of reference material in connection with school work. Many of the forms of plant and animal life discussed in the text are pictured in the outstanding illustration in this book, which is published by Whittlesey House, McGraw-Hill Book Company, at $3.50.

Gropings

This is the title given to a little paper-covered book in which Ruth Bishop, 10 Terrace Park, Rochester, N. Y., has gathered an attractive group of Nature and outdoor poems. Copies are available from the author at fifty cents.

The Cardinal's Distress

By Alice B. Huff

A few years ago, during a prematurely warm season in March, a pair of cardinals built a nest in a rose vine that had climbed up our front porch, which is only three or four feet from the sidewalk. A few weeks later, winter returned one night, bringing a deep snow. And when we went into the living room just after breakfast, we noticed the mother cardinal dashing herself against the window-pane, which was just across the porch from her nest, meanwhile making piteous calls. Immediately we thought that her nest must be filled with snow, although it was partially protected by the rose bush and the overhanging eaves of the porch. My husband hurried out to the nest and scooped out the snow, and to our joy, the bird went back to her nest. Then we learned that she was sitting, and in due time, three of the four eggs hatched. And later when another nest was built on the opposite end of the porch, we enjoyed thinking that the same bird remembered us and wanted to reward us for our kindness to her that spring.

Animals and Music

By Charles R. Dutton

Judging from recent reports I have read in various newspapers and magazines, and from my own personal experience, it is evident that we humans are not the only patrons of music. Poultry farmers in several different states report that the installation of a radio in their hen houses increased their number of eggs laid. On the other hand, removal of the radio resulted in a decided drop in the egg production. In Ohio a farmer installed a radio in his cow shed so that he might listen to his favorite early morning programs while doing his chores. To his surprise he soon was receiving quarts more of milk from his cows.

One day last summer I proved to my own satisfaction that cows must be thirsting for song. While strolling by a pasture that contained thirteen heifers I sang "The Donkey Serenade." Soon the young cows stopped their grazing and listened. By the time I reached the second chorus they all started walking toward me. For about an hour I entertained them with all the latest popular songs, and I had a most appreciative audience.

Only the other day, while tramping in the woods, I came upon a gray squirrel sitting up on a stump. I whistled "The Snake Charmer" and "The Blue Danube" and approached him slowly. He remained perfectly still as though too fascinated to move. I managed to come within five feet of him before he finally showed any life and dove under a brush heap.

Shade Tree Conference

Arborists and all others concerned with the field of shade tree planting and care will convene at the fifteenth annual session of the National Shade Tree Conference to be held at the Hotel Astor, New York City, August 22 to 24. Information about the meeting and the work of the Conference may be obtained from L. C. Chadwick, secretary-treasurer, Ohio State University, Columbus, Ohio.

Plants to Eat

Edible Wild Plants is the descriptive title of a new book by Oliver Perry Medsger. It is, so far as we know, the first really complete guide to the wild menu that our native flora affords, and it includes within its covers discussion of virtually all the edible plants now growing outside of cultivation. Following a foreword by Ernest Thompson Seton, the author deals in order with wild fruits, nuts, seeds and seed pods, salad plants and potherbs, roots and tubers, beverage and flavoring plants, sugars and gums, and mushrooms. Mr. Medsger combines description of the plants with interesting information on their historical employment as a source of food and with description of the manner in which they are prepared for addition to the menu. With this book along, one should not starve in the wild. Geographically divided, there are finding indices and a complete general index. The book is illustrated from photographs and line drawings. It is published by Macmillan at $3.50.

BULB PROGRESS

(Continued from page 378)

Of course breeders continue to strive for size. Why they would name the grandest of the new giant Leedsi "Daisy Schaffer" is a mystery. Mitylene, Gertie Millar and Her Grace are three medium-priced, distinctly worthwhile varieties.

I have reserved the large trumpet daffodils until last, because they are bold enough to blow their own horns. That the trumpets are getting bigger, is proved by Lord Wellington and Insurpassable among the pure yellow varieties. Beersheba and Roxane are the grandest among the pure whites, while the bicolor Madame Van Waveren easily matches yellow Lord Wellington, as regards both size and graceful shape. But to me, increased size has ceased to be a novelty. Rather would I praise the departure of filling these trumpets with extra petals. Holland's Glory is well named, for it represents a culmination of efforts on the part of generations of breeders.

And while Holland's Glory's cup is overflowing, that of orange-colored Valencia is spreading. In Valencia we find a charming novelty of exquisite beauty, which, in this instance, is not impaired by huge size. It's an extraordinary combination—double rows of perianth segments of a golden-yellow intermingle with shorter petals of soft orange color. Mary Copeland almost equals Valencia in beauty and fits slimmer purses much better. In viewing both Valencia and Holland's Glory in a single vase, it is hard to decide which deserves the most praise.

Something tells me that this story will not be complete without mention of a perfectly lovely but poorly named innovation. Pink daffodils are in the making. The best-known, as yet introduced, is called Mrs. R. O. Backhouse, after the well-known British woman hybridizer. From an ivory-white perianth protrudes a most refined, long, slim trumpet of apricot pink. This changes to shell pink at the deeply-fringed edge, turning paler as the flower ages. The cost of a dinner at the average hotel seems a small price to pay for a bulb of this definitely exquisite creation.

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American Foods

The history of the development of many of the items of our diet that we now take as a matter of course is fascinating, even romantic. It is this that gives A. Hyatt Verrill his main theme in his book *Foods America Gave the World*. Ranging from the grass that we call corn to the Thanksgiving bird, this book makes interesting reading and contains much valuable information for the school youngster and for the adult reader. In the compilation of the appendices listing and classifying the American food plants, the author has had the collaboration of Otis W. Barrett. This book is published by L. C. Page and Company at three dollars.

About Trout

Anglers, specially trout fishermen, will find much of interest in *Speckled Nomads* by H. E. Townder Coston. This is not a book about fishing but about fishes, in particular about the brown trout. There is a sub-title to this book—"A Tale of Trout in Two Rivers"—and this refers to rivers far, far apart. Trout from the same trout farm were planted in an English river and in a river in New Zealand, and Mr. Coston tells of the comparative results, discusses the life habits of these fishes and describes the acclimatization of trout in Antipodean waters. The book is published by Macmillan and sells for three dollars.

Dallas Plants

Mrs. Norma Stillwell is the author of a useful and handy little book of interest to Texas amateur and professional botanists. It bears the title of *Key and Guide to the Woody Plants of Dallas County*, which is thoroughly descriptive. Copies are available at fifty cents from book stores in the vicinity or from the author at 7460 San Benito Way, Dallas, Texas.

Ancient American Man

There comes to hand from the Colorado Museum of Natural History in Denver a fine popular booklet entitled *Ancient Man in North America*. It is the work of H. M. Wormington, Curator of Archaeology, who has in this publication sought to give a brief survey, in as comprehensive form as possible, of archaeological accomplishments in North America, and to point out the gaps still existing in our knowledge. Also he has endeavored to present the subject in a manner acceptable to the intelligent layman interested in this field. The author has succeeded admirably in both instances and has produced a valuable popular bulletin, which is available from the Colorado Museum of Natural History, Denver, Colorado, for thirty cents.

Animal Painting

Lovers of animals, both wild and domestic, will find fully as much of interest in *Animal and Bird Painting* by Charles Simpson as will artists and art critics. The author is both an animal artist and a critic and has given long study to the works of great animal painters. The book is unique and its interesting and enlightening text is supplemented by many reproductions of outstanding animal paintings. Published by Charles Scribner's Sons, the book lists at $3.75.

INDOORS AND OUT

(Continued from page 367)

emulating would on first thought have been more appropriately considered with William Morton Wheeler's *Essays in Philosophical Biology*, discussed on this page in the last issue of NATURE MAGAZINE. The coincident at least reminds me that although we may spend vacations in the mountains in August most of us do have to descend by September and that, even so, in our own dooryards we can find much of the wonder of the outdoors. It would require the training of a sociologist to judge the human implications in this work, and I trust that I shall never have to qualify for this, but it requires only a casual examination of the book to become intrigued into reading it carefully and entirely. Necessarily it increases one's knowledge and possibly his understanding of ants, their "cities", their social ties and compulsions, their fascist or communist dictatorships, their wars, their slavery, and certainly their bustle. Fascinating as all this is, I could only hope that this might be one "state of Nature" that we can stay as far away from as we are at present. I can't imagine, after reading *Of Ants and Men*, that any myrmicine individual could ever wander away to mountains in August and still return to his social life in September.

Southern Trees

Beautifully and profusely illustrated, textually interesting and informative, *Trees of the South* by Charlotte Hilton Green is a valuable and useful addition to botanical literature of this section of our country. The author goes further than providing a mere identification, and her prose is charmingly descriptive, bringing in, here and there, some legends, and a general picture of the importance of the various trees to the Southland. The University of North Carolina Press has collaborated splendidly in the physical reproduction of this book, which sells for the amazingly reasonable price (considering the quantity of illustration) of $2.50.

Scientific Terms

First brought out in 1920, *A Dictionary of Scientific Terms* by I. F. and W. D. Henderson now appears in a third edition, which is revised from the 1929 second edition by J. H. Kenneth. This valuable library book gives the pronunciation, derivation and definition of terms used in biology, botany, zoology, anatomy, cytology, embryology and physiology. Such has been the march of Science during the past two decades that it has been necessary to keep abreast of its changing terminology. Published by D. Van Nostrand Company, this important book sells for seven dollars.

A Museum Career

Careers in Museum Work is the title of a vocational monograph issued by The Institute for Research, which devotes itself to vocational research. This is, as the title suggests, the report of a study of this specialized field and of the opportunities that it offers. Copies may be purchased from the Institute at 537 South Dearborn Street, Chicago, Illinois, for one dollar.

Woodpeckers

Anything from the pen of Arthur Cleveland Bent is, of course, a distinguished contribution to ornithology and welcomed accordingly. With the publication of *Life Histories of North American Woodpeckers* as Bulletin 174 of the Smithsonian Institution, Dr. Bent makes his most recent gift to bird lovers. It seems rather a misnomer to describe this 322-page work, with its additional illustrations, as a "bulletin", but it should be so designated when ordering a copy from the Superintendent of Documents, Washington, D. C., for fifty cents.

Tennessee Fishes

A Guide to the Fishes of Tennessee and the Mid-South, by Eugene R. Kuhne, has been brought out by the Tennessee Department of Conservation, Nashville, Tennessee. A 124-page illustrated guide, this booklet should prove popular with fishermen and with students of fishes. Copies are available from the Department at thirty cents, postpaid.

Plant Physiology

This is the title of a fine college textbook written in collaboration by B. S. Meye and D. B. Anderson. The authors have taught this course, and with this background have written a book that keeps abreast of modern developments in this field, and presents established concepts as well. Where points are still at issue, and conflicting evidence and opinion exist, the authors have attempted to evaluate the differing viewpoints. This text is particularly important in view of the steady progress of scientific knowledge and the fact that it does not take long for such a work to become, in part, out of date. Published by D. Van Nostrand, this volume sells for $4.50.

On Growing Herbs

Revival of interest in herbs and herb gardens has sent many people digging back into the old herbals and has resulted in the publication of up-to-date material. The most recent book in this field is entitled *Herbs* and presents information on how to know them and how to use them. It will aid the individual in planning a herb garden and will provide much information both on the lore of herbs and on their practical use in the kitchen. Written by Helen Noyes Webster, this book is published by Hale, Cushman and Flint at one dollar.

About Butterflies

The Oxford University Press has brought out pocket texts for identification of the birds, beasts and flowers of the British Isles and now brings out, in the same format, *The Butterfly Book*. It covers all the species found in Britain and is illustrated with life-size colored plates and presents life histories of each. The price is three dollars.

Southwestern Reptiles

Bulletin Number 14 of the Zoological Society of San Diego is devoted to a report on studies of reptile life in the arid southwest and is by L. M. Klauber, consulting Curator of Reptiles of the Society. It is of particular interest to herpetologists, since the material is not presented for general lay consumption.

Diana Thorne's DOG COLUMN

A DOG'S DIET

Unlike a cat, a dog will eat, at any time of the day or night, any food that is available, or that may be offered, if he likes it. He may indeed eat until he is sick and then start all over again. Like the little boy who went to the party and was warned that if he ate another piece of cake he might burst, and who said, "All right, give me the cake and get out of my way," the dog generally doesn't know when to stop.

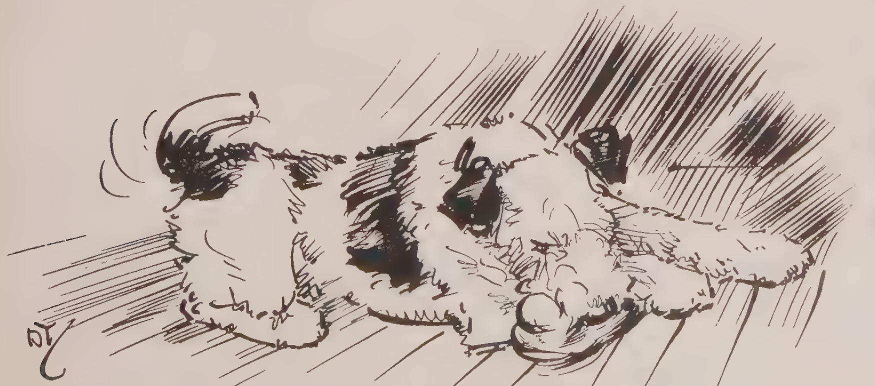
Whereas the cat is dainty, chews carefully, will not take food that is injurious to its system, or eat more at one time than it requires for nourishment—even when coaxed—the dog does none of these things. He is a glutton at any age. He loves to eat and generally his appetite far exceeds his capacity.

For this reason the chief contributing factor to illness in a dog is his stomach. Overeating, the wrong food, more than one meal a day—these cause the various stomach and intestinal ills that befall dogdom. Dog feeding requires a severe discipline. That is essential if you really care about your dog, if you wish his life to be long and happy and your own to be unworried. The dog's life is short enough in the natural course, and with increasing traffic, hit-and-run drivers, lack of grass in cities, and other handicaps, that short life is likely to be made much shorter, and, so, much unhappier!

Everybody who knows anything about a dog is aware that any grown dog thrives best on one meal a day. This meal should be sufficient, and the constituents must be clean, fresh and exactly right for the particular dog. He should be fed at the same hour and in the same place and out of a dish to which he is accustomed. He should always have plenty of fresh water available, however. For the good of their teeth all dogs require bones and the only kind of bones should be beef bones, or mutton bones, *never* rabbit or bird bones.

Lean meat is the best item in the diet of any dog. Vegetables, if well cooked, may be mixed in a meat stew, but they are not essential to a dog's well-being, contrary to the belief held by vegetarians. A dog's stomach is not like a human stomach. It does not require the aid of green food to the same extent. If your dog lives in the country, he will eat grass when he desires to do so. But just remember that, with him, cooked vegetables are never a substitute for grass. Pickled or spiced foods, pastries and candies are harmful if not deadly, and permitting your dog to eat them will cost you plenty in medical care as well as in your dog's health and happiness.

Puppies up to six months of age should be fed three (Continued on page 412)



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A DOG'S DIET

(Continued from page 411)

or four times a day, the amount and kind of food depending on the kind or breed of dog. If you have a puppy to feed and are not an experienced dog-owner, get careful instruction on this point first. Ground beef, milk and an occasional teaspoonful of cod-liver oil form a basis that generally will keep your puppy in good health. After nine months, and up to one year, feed him twice a day. After that, start on the one meal a day. Dry toast, or cooked oatmeal or other cereal (provided the dog is not permitted to eat it while hot) will do him no harm, and the well known dog-biscuit is always a safe bet. So are the various canned dog foods. Most of them are good and palatable, but no dog should be fed constantly on this diet, without variation.

Under-feed your dog rather than over-feed him. A dog in good health is lively, playful, good-tempered, has clean and sparkling teeth, a pure breath and a strong, thick and healthy coat. A dry coat and an irritable skin in your dog, if and when you see them, are signals of distress. So also is foul breath, a dull eye, irritability and lassitude. When you see any of these things, don't urge your dog to eat, but urge him to fast. An occasional fast is good for both dog and human, and is a simple, elementary measure against disability. Cats deliberately apply it as a health measure and a cat's behavior is well worth watching, for what a cat doesn't know about life and about health preservation is, generally speaking, not worth knowing.

Do not ever feed your dog at the family table, or permit children to do so. If you do, sooner or later you will be sorry for it. You merely encourage bad manners. Let the dog eat his dinner first—in the kitchen and in his own corner. Give your dog a dose of mineral oil about twice a month. If your dog is exceptionally well, and enjoys daily active exercise, or is in the country, once a month will do.

Never allow your dog to pick up scraps in the street or when walking with you. That's a sure-fire method for leading him to ultimate poisoning! If you train him properly he won't do it.

Good behavior and good health in a canine, just as in a human, depends *entirely* on early and proper training.

Plant Key

Of specialized interest is *A Field Key to the More Common Non-Woody Vascular Plants of Central and Northern Minnesota* by John B. Moyle of the Minnesota Department of Conservation. It has just appeared in a third revised edition and is available at one dollar a copy from the Burgess Publishing Company, Minneapolis, Minnesota. It is in loose-leaf form.

Recreation Congress

The twenty-fourth National Recreation Congress will be held in Boston from October 9 to 13 of this year, bringing together representatives from public and private recreation agencies, from schools, colleges, churches, various governmental agencies, and from city planning, park and housing groups. Dr. John Finley will preside. Further details may be obtained from T. E. Rivers, National Recreation Association, 315 Fourth Avenue, New York City.

Nature Guides

Nature guides are available at eight of Indiana's state parks this summer, so popular has this service proved to be. In 1938 these guides led 15,152 park visitors on bird and plant life hikes and presented programs for a larger number. The service is maintained at Pokagon, Indiana Dunes, Turkey Run, McCormick's Creek, Brown County and Clifty Falls state parks.

Delaware Wildlife

In the hope that it will give impetus to more complete studies and publications on natural science subjects in Delaware, the State Board of Game and Fish Commissioners has issued a mimeographed booklet entitled *Our Animals, Birds and Fish of Delaware.* It is necessarily rather concentrated in form.

Wants to Exchange

Myron Crum, Glen Flora, Wisconsin, is interested in exchanging shrub and tree specimens, an appropriate enough interest in view of his post office address. He also is interested in minerals and in corresponding and exchanging with others having a similar interest.

The Peke

The Pekingese is the latest addition to the Judy Publishing Company's group of dog books. It is the work of Anna Katherine Nicholas, show judge and breeder, and it treats with this dog from its ancestry to the manner in which it should be shipped. In other words, it covers the dog from every point of view. The price is two dollars.

Herpetologists' Note

Among our readers are quite a group of young men interested in herpetology, and they are eager to get in touch with others having a similar interest. We have published the names and addresses of several of these enthusiasts and the latest recruit is John Crenshaw, Jr., 740 Virginia Circle, N.E., Atlanta, Georgia.

Yosemite Conifers

The May, 1939, issue of Yosemite Nature Notes, published by the naturalist department of Yosemite National Park, is devoted to *The Cone-Bearing Trees of Yosemite.* Written by James E. Cole, junior park naturalist, this pamphlet pictures and describes in popular terms the conifers of the Park. Copies are available from the Yosemite Natural History Association, Yosemite National Park, California, at twenty-five cents.

Animal World

Morris D. Aiken, H. A. Olsen and John A. Patten, co-editors, have changed the name of their semi-annual mimeographed Nature magazine from *Snowy Egret* to *Animal World.* Thus they are less restricted in their editorial content. Publication offices are at 172 Manchester Street, Battle Creek, Michigan, and subscription is fifty cents a year.

HAVE CATFISH GONE MODERN? CERTAINLY!

by Mabel F. Whittemore

"Mother, come quick if you want to see something a-w-f-u-l-l-y funny!" The call came from our wharf, where my young daughter was kneeling and watching some object in the shallow water.

We did not hurry, but strolled down to the water, feeling fairly sure we had already seen most of the "a-w-f-u-l-l-y funny" things to be seen in the shallow water at almost any hour of a calm, sunny day. There were the water striders with the never-ending game of tag; the many zigzag paths on the mud bottom made by the clams in their slow search for food; the handsome dragon flies clinging to the wharf while their wings became dry and strong—the recently discarded nymph skin near by. Oh yes, our wharf was a regular grandstand for "funny things". However, "Pride goeth before a fall", and we were not at all prepared for the really astounding performance which we were privileged to observe during the next forty minutes.

From the dark recesses under the wharf there had just emerged father, mother and two or three hundred baby catfish. We had often watched large schools of very small minnows with, of course, no parents in attendance, but this was a fish family extraordinary.

Father catfish was in complete charge of the family, mother not being allowed to come near, but forced to swim back and forth, several feet distant, and keep all young sun fish and black bass from becoming too much interested.

The babies, looking like very small black tadpoles, were crowded together like a solid black pancake about six inches in diameter, with never a baby straying even half an inch from the fold. The father catfish hovered directly over the mass of babies and in some manner, quite beyond our power to understand, caused the pancake of babies to move very slowly along the mud bottom, without ever for an instant losing their solid mass formation. It took about twenty minutes for the family to reach its destination—a beautifully mottled patch of mud bottom, caused by the sun, which was almost directly overhead, shining through a small overhanging shrub. The distance covered was about six feet.

When the mottled patch was reached, the "pancake" disintegrated and became a part of the mottled mud floor.

After such a slow and careful journey, we quite expected the family would remain in this pleasant spot for the rest of the morning, but to our surprise "the children" were only allowed three or four minutes' "recess", when at some signal from the anxious father, the pancake once more formed and the return journey to their home under the wharf was commenced. This journey was carried on in exactly the same manner as the outward journey and occupied almost exactly the same amount of time—twenty minutes, until at last, all the members of this interesting family were safely under the wharf, the mother disappearing last. Several times during the outing the mother attempted to join the family party but was sent back to guard duty in no uncertain terms.

Needless to say, the astonishing catfish family was the subject of conversation for the rest of the day. The length of time spent in the actual journey and the extremely short time spent at the outward destination led us to feel sure that it was the health-giving sun bath on the journey rather than the few relaxing minutes under the overhanging bush which the fond and up-to-date father felt to be important.

The forward movement of the pancake of babies had us completely puzzled—and still has. The mass seemed to remain immovable with the parent fish hovering directly overhead, and yet, imperceptibly space was covered. We wondered whether the father was able to set up a forward movement of the water with his fins which very slowly worked the little black raft forward.

Many times during that first day did we run down to the wharf to see if the catfish family were "taking a walk" but there was no sign of them. The next morning was calm and sunny so we still kept watch. Once more our remarkable family astonished us. Not until the hour at which they had appeared the day before (about 11 a.m.) was there any sign of our catfish, then they proceeded to repeat exactly their previous performance.

For four successive mornings a group of us watched these interesting and up-to-date parents give their children a sun bath—always when the sun was almost overhead and causing the protective mottling on the mud bottom. Then the weather broke and for several days we had rain and wind. When sunny days came once more we watched eagerly for our interesting family but the babies had evidently developed past the age of sun baths and did not return.

For the Hiker

Eastern hikers will find particularly valuable a booklet entitled *Cooking—Carrying—Camping on the Appalachian Trail*. It is a sort of joint work assembled and edited by S. W. Edwards. Warren N. Watson supplies information of suitable equipment for men and women and on fire-making; Tracy F. Caldwell contributes menu and cooking advice. Mr. Edwards contributes the rest of the concise information in the booklet. This handy little seventy-page brochure is not published for profit, but the authors would like to break even so ask twenty-five cents for it (two thin dimes and a five cent stamp, Mr. Edwards suggests). Also if clubs would like to buy a number of copies special discount of ten per cent for ten or more copies will be made. Order from S. W. Edwards, Box 331, Silver Spring, Maryland.

Northern Wild Flowers

A not too highly technical guide to the wild flowers is provided in *Wild Flowers of the Northern States and Canada* by Arthur Craig Quick. The range of the book is amply indicated by the title. It covers some six hundred species, and the text presents the life cycles, habits, traits, haunts, range, frequency and pollination of the various flowers. Some suggestions on the domestication of the flowers is included. Besides numerous line drawings, the book is illustrated by several color plates by Constance Stampell. The publishers are M. A. Donohue and Company and the price is four dollars.

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UNDER THE MICROSCOPE

by

Julian D. Corrington

Sands and Soils

One of the major sciences not touched on thus far in our series is Geology, a family of related studies dealing with the Earth. Some of the geological sub-sciences employ the microscope extensively and are of vast industrial and agricultural importance.

A good place to make a beginning is at the end, observing the result of those forces, weathering and erosion, which disintegrate and destroy the rocks of which our earth's crust is composed. For at this stage the rocks have been so shattered, broken up and even pulverized, that the resulting sands and soils may be placed under the microscope for inspection and much may be learned thereby.

When you go afield take along a number of pill boxes, envelopes or vials and bring back samples of different sand and soil specimens for mounting at some later opportunity. Your county agent will suggest additional sources, too. Many of these materials will tell an interesting story of their past careers or present utility. Will this soil grow wheat? Is this sand of any value for making glass? The microscope aids in answering many a question of this nature.

Our favorite method of mounting sand is to secure a ring to make what is generally termed a *cell* in microscopy—not to be confused with the same word as applied to the units of structure of plants and animals. A small brass embroidery or curtain ring is excellent; likewise rings of bone, glass, hard rubber or plastics. It is not difficult to make two punches, one a bit smaller in diameter than the other, so that rings may be stamped from sheets of cellulose acetate of any desired thickness. If you have a turntable, you may spin a ring of balsam, asphalt varnish, cement or shellac to any desired height. The object is to provide a circular rim whose overall diameter will fit one of the standard sizes of circular cover glasses, as ¾″, and high enough from the slide to make a chamber in which the quantity of sand may be placed so as to have a slight clearance and be free to move about when the finished slide is tilted or jarred.

For the whiter sands, cut a circular piece of black photomount paper (white paper for black sands) of the same diameter as the cell to be made. Next prepare a centering gauge by placing a blank slide on a small white card; trace around the slide with a soft pencil or with ink; remove slide; rule diagonals to connect opposite corners, and the point where these lines intersect marks the exact center. Now place a thoroughly cleaned slide over this card design, whereupon the ruled lines show through and indicate the center. Over this spot affix the circular bit of paper, using Duco or other household cement, or balsam or shellac. When dry, fasten the ring upon this paper with the same adhesive and allow to dry, keeping away from dust; or spin a ring with a turntable.

When the cell is completely dry, add enough of the sand specimen to nearly cover the paper bottom, but not enough so that the grains will pile up on one another. The sand should be washed a number of times until clean and free from any particles of dust or mud, then dried carefully over low heat. Warm the slide gently to drive off any trace of moisture; apply a thin ring of balsam to the top of the cell; flame a clean cover glass and press it down upon the ring, then place the finished slide away to dry. Some technicians prefer ringing these slides when dry with asphalt varnish or colored lacquers, for protection as well as appearance.

To flame a cover glass: When thoroughly cleaned and dried by the usual means, grasp close to one edge with a pair of forceps and pass rapidly through the tip of an alcohol burner flame several times, first one side then the other. You will observe moisture to cloud the glass and then rapidly disappear. If held too long in the flame, the glass will shatter. This precaution insures that no moisture will collect inside the sealed cell to cloud and obstruct observation. It is a wise step with all slides.

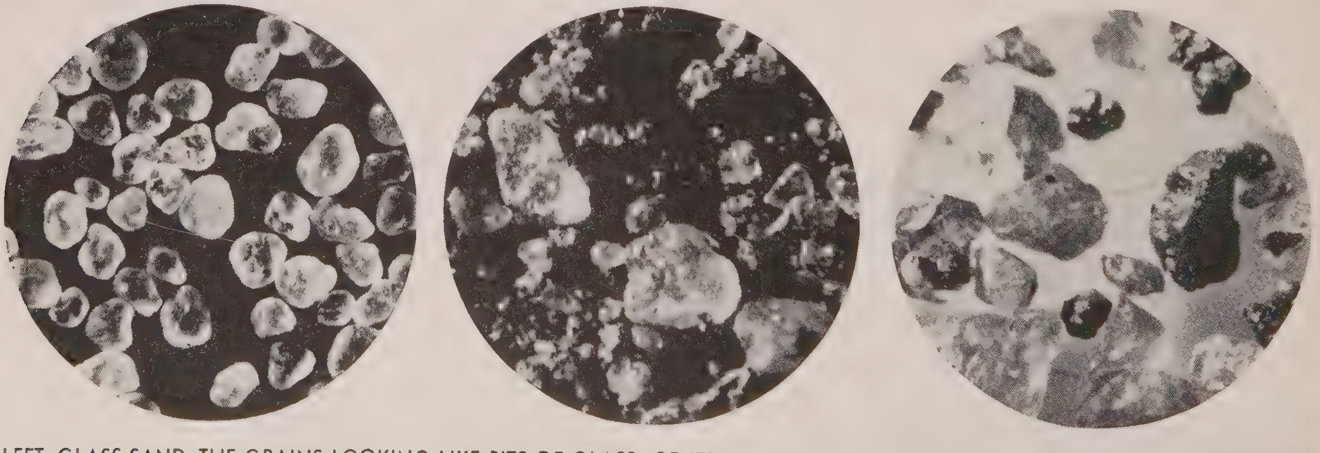
Such a mount is to be observed with the lower powers only, and by reflected (incident) light, falling down upon the slide from above, by means of direct illumination, prism, mirror, or bullseye condenser. Many amateur microscopes are so designed that the mirror may be removed from below the stage and plugged in above for this purpose. For other models, a lady's handbag mirror from the ten-cent store may be wired to the microscope body so as to incline at the proper angle and send a beam of light down upon the stage just to one side of the tube; the fountain-pen type of flashlight is also easily adapted for this use.

Diatoms, Foraminifera, Radiolaria and various soils may be mounted in this same manner, although shells are apt to become broken up and a fine dust get upon the inner face of the cover glass; so that balsam smears are to be preferred. With such soils as clay or loam, prepare a fairly light suspension in a small bottle of water, shake well, then apply one large drop to the center of a clean slide—no paper base or ring this time—and place away to dry thoroughly, later adding a drop of balsam and a cover glass. These slides may be studied with both transmitted and reflected light, and with bright or dark field or polarized light. Sands processed this way permit the use of higher powers, but the grains will generally drift, piling up along one edge of the cover, even after the balsam is thought to be hard.

Mechanically-formed rock fragments (detritus) are classed in geology as gravel, sand, silt or mud, according to the size of average particles. Gravels carried by flowing water or agitated by wave action along beaches become gradually rounded through collision with other stones and sands. In river beds the amount of such rounding off of angular corners is an index to the distance such sediments have been transported from the site of disintegration of the bed rock from which they originally came. Such rounded gravels are classed, again according to size, as boulders, cobbles and pebbles.

Sand consists of particles ranging in size from 2mm to 1/16mm, measurements arbitrarily set for descriptive purposes, and approximating granulated sugar in average size. The larger grains become rounded, like pebbles, but the smaller ones remain angular, due to a buffer action of the water surrounding each grain. Thus the fine sands at the mouth of the Mississippi show wholly angular grains under magnification, being too small for rounding action.

Dune and desert sands, by contrast, become perfectly rounded in the course of time by the grains rolling over one another and being blown against larger rocks, the action being the same as the familiar sand blasting used in polishing or in cleaning old stone buildings. Hence, taking grain size into ac-

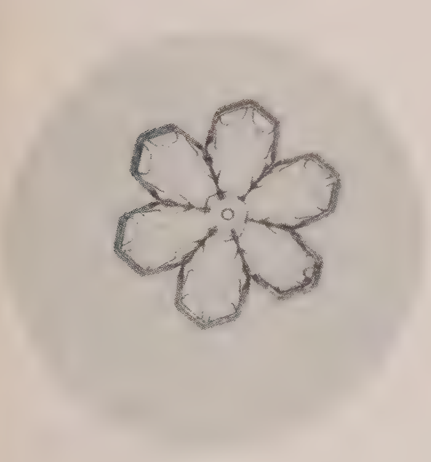


LEFT, GLASS SAND, THE GRAINS LOOKING LIKE BITS OF GLASS; CENTER, A PINCH OF DIRT REVEALS A WONDERLAND OF CURIOS; RIGHT, MONAZITE-GARNET SAND IS A COLLECTION OF MICROSCOPIC JEWELS FLASHING ALL COLORS OF THE RAINBOW count, the type of sand, with something of its origin and history, may be known by means of microscopic examination. River sands are the most angular, ocean sands intermediate, and wind-blown sands the most perfectly rounded.

Sands are composed mainly of quartz (see note on silicon, Jan., 1939) and the grains will not cohere when wet, as do those of silt and mud. Most muds are of clay, with particles less than 0.002mm in diameter, and made up principally of silicates of aluminum.

Suggested for mounting are: ocean beach sand, which will usually show a wide variety of minerals in many colors, as well as differences in grain size and shape; dune sand, more homogeneous in size and composition, and with rounded grains; glass-making sand, very pure and uniform quartz; garnet sand, with a high proportion of small crystals of this hard mineral, handsome in appearance and useful as an abrasive; magnetite sand, containing mostly the iron-ore mineral magnetite, comprising the majority of black grains found in ocean beach sand, and responding to a magnet held under the slide; diatomaceous earth, made up of valves of fossil diatoms; volcanic ash, very fine particles of igneous origin; clay soil; and loam, a soil consisting of a mixture of sand and clay.

Soil study has attained major importance in recent times, with the knowledge that thousands of years are required to produce an agricultural soil, which can be eroded and washed away and lost forever in a few short years through careless neglect, or ignorance of the principles of soil conservation. Rocks must be physically and chemically weathered, numberless generations of plants must live and die, billions of cycles of bacteria must work, adding humus, the organic increment, to soil ere it is fit for farming. The microscope has been a powerful ally in this modern study, which is even now only in its infancy.



Photomike Contest

The present award brings to a close our first series of photomicrographic prize contests, and when the next announcement is made, the nature of the competition will be changed to include work with specified subjects.

First place and the five dollars for this month go to Simon Truman, 2521 Holland Ave., Bronx, N. Y., for the accompanying shot of a snow crystal, a difficult division of photomicrography. This splendidly detailed picture was made by daylight at 3 P.M. in March, using an exposure of 7 seconds and a magnification of 50X. A Bausch & Lomb microscope and Eastman Commercial Panchromatic film were employed. Our congratulations go to Mr. Truman, who has tried long and hard to reach the first position.

Runner-up is the Rev. P. E. Kuehne, Muenster, Saskatchewan, for Smilax root section, and third place was captured by Dr. Edward C. Day, San Anselmo, Calif., with a very clear photomicrograph of a grain weevil and some wheat grains, made through a Spencer 10X hand lens. Dr. Day is an expert at this sort of work.

Trade Notes

It is not difficult to reach the saturation point with books on certain subjects, but the microscopist will welcome as many histologies as he can obtain. Recently there has appeared the seventh edition, completely revised, of Dr. Charles Hill's *Manual of Normal Histology and Organography,* a volume of 530 pages, with 312 illustrations. We very much like the clear and readable descriptions of development, structure, function, and occasional disfunction of the many human tissues and organs, while the illustrations consist principally of very clear and simple drawings, easily interpreted by the beginner. There are also a number of splendid color plates. W. B. Saunders Co., West Washington Square, Philadelphia. $3.50.

* * *

We mentioned previously that Miss Alice Townsend, Red Bank, N. J., ASAM member, had tipped us off to a promising new gadget, and since then have investigated and can heartily recommend to all readers the Raygram Weigh Spoon, made and sold by the Raygram Corpn., 425 Fourth Ave., New York City. If we read all of our own magazine carefully, we would have known about this weighing device sooner, as a note accompanied by an illustration appeared in the photographic section (p. 573) of our Dec. 1938 issue, to which we refer you for a picture. Far less expensive and bulky than a pair of scales, this spoon is equipped with a sliding weight covering a range of ½ to 10 grams and will serve admirably in weighing out various reagents and dry stains used in microscopy. Mention NATURE MAGAZINE when you write. Postpaid, $1.00.

* * *

Are there any twelve-year-old naturalists around your home? If not, how about fourteen? Or thirty? or fifty? *Bruce and Marcia, Woodsmen,* by William P. Alexander and Maribelle Cormack, both museum officers, is a delightful book that is bound to capture the interest of twelve-year-olds of all ages. The two children meet that kindly and learned old gentleman, well named Professor Freudemacher, and the three companions go on a different sort of Nature ramble in each chapter, always discovering things of delightful interest—fossils, the microscope, birds, a vanished ocean, moths, the red man's implements. They make field studies of muskrats, sticklebacks, mason wasps and many other wild neighbors. Authoritatively and

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engagingly written as a story, beautifully illustrated with many clever pen drawings, this second successful book from these two authors will provide just the right sort of nature background for children, and can be read with interest by anyone. American Book Co., 88 Lexington Ave., New York City, $.80.

* * *

Harry Ross, 69 Warren St., New York City, has a new spring and summer catalog ready and states that any reader of NATURE MAGAZINE is welcome to a free copy if he will mention the name of Julian D. Corrington when writing a request. Thanks for the compliment, Harry—that's the first time we've ever qualified as an open sesame.

The field naturalist has another treat in store if he purchases *Nature Studies,* by Professor L. D. Wooster, of Fort Hays and Kansas State College. Spiral wire binding, 115 pages, and many illustrations combine to augment the utility of this valuable contribution, but the reading matter is of chief importance. Here are a few random headings: Common Misinformation About Snakes and Lizards; Children's Questions About Birds; Make a Collection of Insect "Work"; Bird Puzzle; Nature Study and Geography. As will be seen from these titles, the book is important as source material for teachers of general science, biology and nature study. Many tables, lists of references, and compilations of sources are included. Markwell Book Stores, Hays, Kansas. Postpaid, $.60.

* * *

For distribution this month we have a different sort of catalog—one on books this time. Hundreds of volumes are concisely listed, covering chemistry, mathematics, metallurgy, engineering, industry and biology—technical and popular, many quite inexpensive. Interesting as a reference to show where to secure a book on a given subject, you will want a copy of this 24-page booklet put out by the Chemical Publishing Co. of New York, Inc., 142 Lafayette St., New York City. Send a 3c stamp to Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St., N.W., Washington, D. C., and a copy will be mailed you promptly.

American Society of Amateur Microscopists

President, Simon Henry Gage, Ithaca, N. Y.

Permanent Secretary, Julian D. Corrington, Chestertown, Md.

Official organ, *Nature Magazine*, Washington, D. C.

Address all communications concerning the Society to Dr. Corrington at Chestertown, Md. Application for Membership form sent on request. Dues, one year, fifty cents; two years, one dollar. Nature and purpose of organization explained in October, 1938; installation announced in March, 1939, issue of *Nature Magazine*.

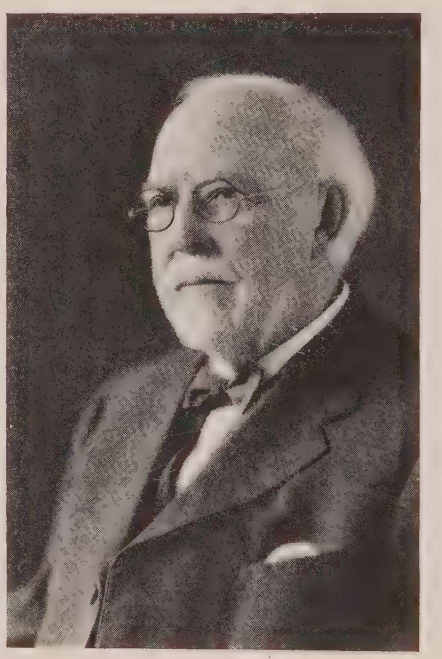
Greetings to the Amateur Microscopists of America from Simon Henry Gage

I am exceedingly glad that there are so many of you in our country. I think of you not only as individuals but as groups, for scientists, like other wholesome people, enjoy getting together in twos or threes or in hundreds to compare simple or wonderful things. And I can only think of you as all young, for Science puts the spirit of immortal youth and hope in the hearts of those who follow her. For you the microscope will drive away care, bring pleasure and appreciation of things beyond ordinary sight, and for some of you it will light that inner fire which is the hope of the future.

It is true that this is a society of amateur microscopists but how often has the world been indebted to amateurs for great strides in its progress? In England, especially, the well-to-do, some of them, instead of frittering away—actually killing—their time, have found in the microscope and other optical apparatus revelations that not only have made life an unending panorama of interest for them, but have opened up or clarified obscurities of the natural world for all of us.

Then think of Leeuwenhoek, the Dutch clerk and janitor, who in his spare time made simple lenses, looked into what was invisible to the ordinary people about him, and found bacteria, living things that play an infinitely greater rôle in the life of the world than do the lions and tigers, elephants and horses of which literature is so full and which are so obvious to every one.

Our own country, too, has had its amateurs whose spirits have been set aflame. I once heard the great geologist, Dana, tell a group of teachers what he thought made good teaching. He illustrated his statement by an incident of his own youth. When he was a boy in a country school in up-state New York, the teacher used to take his pupils on geological excursions and fossil hunts. On one occasion they found so many treasures that all their baskets were full and then some still more wonderful ones were uncovered. None could be thrown away to make room for the last ones, and those were too precious to leave behind, so the teacher cut off one of his trouser legs for a bag, and in that the prize specimens were carried home. That experience helped to make a geologist of Dana.



DR. SIMON HENRY GAGE

It has been my privilege to show a multitude of young people how to use the microscope, and to give them a start on that fascinating road. None has ever forgotten the happiness given by those early looks into the revealing glass, and some of them, like Theobald Smith, have continued to look till all mankind, in all lands, has been enlightened and benefited by their findings.

In closing let me tell my young friends one story to show what may happen to them when the fascination becomes all-pervasive. A certain amateur had heard that a complex phenomenon in a living thing took place in a special and revealing manner in a particular kind of light. He wanted to see for himself if it were so. He did not have the necessary apparatus nor know how to use it, but I showed him what to do and loaned him the apparatus.

In order to be sure in the experiment it was necessary to have none but the special light, so he must work in a dark place. You know almost any room is dark at night, so he watched through the microscope all night to see what would happen. He saw the complexity untangle itself and afterwards when he was telling me about it, his eyes shone with enthusiasm, and he added, "I was so sorry when it commenced to be daylight."

We had hoped to show you our new emblem in this issue, but the time was a bit too short. Members who have paid dues will soon see this beautiful piece of art work on their Certificates of Membership, and doubtless we can run it in the next issue of the Magazine too. More about the emblem and its designers later.

Do you subscribe to magazines? Then rally 'round, brethren, and help support an ASAM member who makes his living by this means. Drop a postal card to John Paul Black, 208 King Ave., Columbus, Ohio, and ask for his catalog of magazines; then send him a few subscriptions.

Oops! Sorry! We promised in the last issue that you'd have your membership list by the time that number of the Magazine was in your hands. And then we slipped up and couldn't make it. Blue books, final term reports, manuscripts, ASAM correspondence, and so on ad infinitum; it's a sad story, but we'll try to live up to all future promises.

Not much room in this issue for detailed news, but next to Dr. Gage's greeting, the big item is announcement of formation of the Exchange Department. Here's what to do: write a postcard or letter to Dr. Corrington at 118 Water St., Chestertown, Md., and list the items in which you are interested—slides, instruments, specimens, gadgets, books, or whatnot. Designate by the letters B, S, and E whether you wish to buy, sell, or exchange, or any combination of these methods. The Secretary will then put you in touch with others having the same or similar interests, or will issue a Bulletin if the response justifies, listing all of these entries. Here is a golden opportunity many have been awaiting, so get busy with pen or typewriter and let us have it!

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POCONO MANOR, PA.

LOOKING FORWARD

Jackasses with Feathers . . .

Well, not exactly that, but, at least, feathered jackasses. That is the name given to one species of penguins, those ever-interesting birds. In a charming article in the November issue of Nature Magazine, Eleanor Ullmann tells of a visit to the penguin colony.

How Good Are Your Furs?

Fashion, name and advertising is what sells furs, but just what do you know about furs? What is the strongest; what the poorest? What goes to make up fur, and why do not all the hairs drop out? In November there is a fur article that is different from anything you have ever read.

And, also . . .

An article on the elusive rock squirrel by Lee R. Dice; a story of potatoes that grow in a string like peas in a pod by Robert Sparks Walker; an estimate of "Ducks Unlimited" by Tony Lascelles; a unique antelope story; a picture story of an island where the trees are of sandstone; and many other features.

A SUGGESTION—At Christmas time, or any other time, the gift of a Subscribing Membership in the American Nature Association is a welcome gift to any friend who loves the outdoors.

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A Loyal Catbird

In the August issue of the Ohio State Dental Society *Journal,* the chairman of the publication committee, Dr. E. C. Mills of Columbus, forgets molars and bicuspids and devotes his editorial page to a report on a catbird friend that has been coming back to visit him for at least four years. First won to friendship by bits of cheese, the bird now will perch on Dr. Mills' hand, or on the friendly fingers of many of his professional acquaintances. In fact, the bird has attained wide fame among the Ohio dental fraternity. Dr. Mills is interested to hear of others who may have attained similar close friendship with catbirds. His address is 255 East Broad Street, Columbus, Ohio.

Going Birding

Detroit is fortunate in having, through the *Free Press,* one of the outstanding newspaper writers on the outdoors. He is Jack Van Coevering, who, with Ben East and a few others, is not content with writing just a rod and gun column. A supporter of legitimate sport, he is also a real conservationist and looks upon the outdoors and the world of the wild as something of interest to all. Now Jack's name appears as the author of a fine book entitled *Real Boys and Girls Go Birding.* Here is a story of adventures afield by and with young people. It is based upon many experiences with boys and girls that go birding and is delightfully written with action and personalities. Here is an ideal gift for any youngster. Ninety-eight fine pictures supplement the text. The book is published by J. B. Lippincott Company at two dollars.

Studies in Dormancy

The factors governing dormancy and hardiness in plants have had much intensive study by technical plant workers. Many theories have been advanced and followed through, but still little definite information is available. On the other hand, methods of breaking the dormancy of seeds and bulbs have gone forward, and today we have many chemicals that assist the propagator in securing early growth.

John W. and Jessie Blachly, Box 26 & Drexel, Oklahoma City, Oklahoma, have been working in this field. For example, in the spring of 1938 they inoculated peach buds near the point of attachment with extract of peach leaves. The buds were delayed four days. In the spring of 1939 three branches were inoculated and bloom was delayed from ten days to three weeks later than normal. The Blachlys feel that the principle may be widely applicable; that early bloomers may be made late bloomers; non-hardy trees made hardy. They need collaborators, however, and Mr. Blachly has asked us to spread the word that "if studying plant growth is your hobby and you would like to take part in a systematic investigation of this field of plant behavior, either as a financial contributor or a local investigator, we would like to hear from you and tell you how you can help. Every collaborator will be furnished with a copy of notes, a bibliography and methods."

To People who want to write but can't get started

Do you have the constant urge to write but the fear that a beginner hasn't a chance? Then listen to what Fulton Oursler, editor of Liberty, has to say on the subject:

"There is more room for newcomers in the writing field today—and especially in Liberty Magazine—than ever before. Some of the greatest of writing men and women have passed from the scene in recent years. Who will take their places? Who will be the new Robert W. Chambers, Edgar Wallace, Rudyard Kipling, and many others whose work we have published? It is also true that more people are trying to write than ever before, but talent is still rare and the writer still must learn his craft, as few of the newcomers nowadays seem willing to do. Fame, riches and the happiness of achievement await the new men and women of power."

Normal School Principal Finds N.I.A. Gives Real Service

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Camera Trails

BY NORRIS W. HARKNESS

Photographing Small Animals

Making pictures of small animals would be easy if they would only realize the difficulties under which we are working and be a bit more cooperative. But they don't seem to care!

We need the biggest possible image, sharply focused and without any trace of motion. The large image calls for a short distance between camera and subject; the sharp focus demands the use of a small aperture to cover the whole area through which our subject can move; and the stillness of the image on the film requires either a very short exposure or a motionless animal. There are various angles to our dilemma. The stopping down of the lens demands either a long exposure or a very bright light, and neither works out well. Most animals cower in a corner when such lights are thrown on them and we cannot make a life-like shot. If you have ever tried to make a field mouse, or any of his kin, stay put in a normal, happy pose while you focused the camera and made an exposure of perhaps a second, you know the trouble you had and how much film you wasted. We are limited, then, in the amount of light we can use and in the time we can leave the shutter open, and our only sure solution to the problem lies in the use of a larger lens opening and a consequent reduction in the depth of field we may need.

This can best be done by the construction of an enclosure that will keep the animal at about the same distance from the camera all the time and yet not interfere with the naturalness of the picture. Moreover, it cannot have corners in which our subject can hide, should make him feel as nearly at home as possible, and help rather than hinder our lighting. The construction of a gadget to comply with all these requirements is much simpler than it sounds. For materials we need only a piece of glass, something to use for a base, and a cardboard slightly larger than the glass together with enough scotch or adhesive tape. The glass we used for a hurry-up cage came from the mount of a 16 x 20″ print and the cardboard was the same size. The card was cut to a sixteen-inch square and fastened to the glass with the scotch tape so that the end of the glass coincided with one side of the card. The opposite edge of the card was stuck to the glass fourteen inches from the edge making a chamber whose front was the flat glass and whose curved cardboard back was three inches from the glass in the center. The whole stood on a small table and strips of the tape prevented its falling over. The corners were too sharp and too brightly lighted to seem like shelter to the mouse for whom it was made and he stayed well toward the center. However, grass and other material that added a touch of naturalness to the scene were placed in the corners, and earth and more grass on the bottom of the cage. Further trimming and details could be worked out for various kinds of animals and it is best to make the surroundings as fitting to the subject as can be done conveniently in the space. Do not, however, try to make the center of the cage too elaborate. The animal may find some spot that is protected enough to prevent your getting the clear picture you want. Wire netting over the open top is a wise precaution. Had we used it from the beginning, a tiring and hot chase would have been avoided.

When the cage was ready, the mouse was put into it and left entirely alone for an hour or more, or until he began to move about quietly. The camera was set up straight in front of the glass—tilted down a little to avoid a hard straight line across the bottom of the picture and also to reduce the danger of getting too much reflection of the camera in the picture. There should not be any windows or bright objects behind the operator. Their reflections might show. We found that at a working distance of thirty inches with a six-inch lens in the camera, we could cover the whole three-inch depth of the center of the cage with an aperture of f/8. At f/5.6, the background was out of focus and detail in the grass in the back of the cage was not quite sharp. The camera was focused and set ready for the picture, and the two lights then set up well to the sides. With them near the camera, they would shine into the lens, but when they were placed as near the line of the curve of the cardboard as they could be without casting shadows on the background, there was no trouble. Photofloods in reflectors were used, one three feet from the center of the stage and the other four feet away to unbalance the light enough to make it look natural. The more distant light was just above the floor of the cage and the nearer one a foot higher. This combination made possible an exposure of 1/50th second with the f/8 aperture which successfully stopped any motion.

Since a natural position of the animal is vitally important to the final effect of the picture, it is well to leave the subject in the cage for some time before attempting a picture, and the lights ought to be turned on at least half an hour before the exposure, or at least long enough for it to begin to act normally. During this time the operator ought to be in sight from time to time so that his presence does not frighten the animal too much when the picture time comes. Then, with patience, a good record of the little beast's appearance is simple,'and it may even be a good picture from the pictorial standpoint.

Infra-Red Photography

So many readers of this department have asked about the characteristics and use of infra-red films, that we are using this space to answer their questions at greater length than could be done in individual letters.

Early films were sensitive only to blue light. Then the manufacturers found that adding dyes to the emulsions made them record the green and yellow rays, making our films orthochromatic. Other dyes added to the emulsions gave us the panchromatic films that are affected by all the colors of visible light, and still others allowed us to make pictures with the rays our eyes cannot see, the infra-red. These rays are really heat rays rather than light rays, since we regard as light only those frequencies that we can see—and are emitted by all light sources and by any object that is hot enough. A hot flat-iron, for example, may be used as the source of infra-red rays that permit us to photograph not only the iron itself but also objects near it, even though there is no visible light from the iron and the room in which the picture is made is dark. Naturally such exposures are quite long, but the film may be used in the ordinary camera at normal, hand-held speeds in bright sunlight.

For daylight work a so-called "minus blue" filter is necessary, as the film is sensitive to the blue and violet rays as well as to the infra-red. This may be the Wrattan "A" or "G", or any of the very deep yellow, orange, or red filters. The more completely the filter eliminates the visible light, the more use is made of the infra-red rays, and the greater is their effect. If no filter is used, the sky will be bold, greens and yellows very dark, and the whole scene will be not unlike one made on color-blind film. With the minus-blue filter, however, the sky is nearly black, shadows are almost entirely lacking in detail, and greens are white. Summer landscapes seem to be snow scenes, and the whole effect is fantastic. An exposure meter is of little value as light that seems to be the same on different days may be totally different when working with the infra-red. With the lens open to f/4.5, the usual exposure will be from 1/50th to 1/5th of a second with 1/10th about the average.

One characteristic of infra-red photography is the ability of these rays to penetrate mist and fog. The water particles that form mist interfere with the shorter wave lengths of light (the blue end of the spectrum) far more than with the longer end (the reds), and with the still longer infra-red least of all. With color-blind film, then, fog is most emphasized since this kind of film uses only the blue light. Panchromatic film—more sensitive to red—cuts through the fog better, but the infra-red film, not using the visible light at all and, with the filter, sensitive only to the very long wave lengths that slip between the water droplets almost without being affected, penetrates the fog so well that we can photograph distant things that we cannot see. The U. S. Army Air Corps has made pictures of a mountain more than 300 miles from the camera with infra-red film and a minus-blue filter.

Portraits by infra-red are strange and may be fun if we have a subject who does not mind caricature. Facial lines will be tremendously over-emphasized, eyes are black holes, lips are much lighter than they appear, and the flesh tones are all chalky. Skin blemishes and tiny veins just under the surface photograph black, and such pictures will add little to our reputations as portraitists.

The Nature photographer will find his own uses for infra-red film. Using it judiciously, he will be able to show many things that defied his camera with ordinary film. Macrophotography and microphotography are increased in scope, and the technical man will find many interesting results, but he will have to learn the technique and the possibilities by trial and error.

This and That

The Weston Electrical Instrument Company have announced a new exposure meter, the Weston Master, which seems to embody everything desirable in an instrument for all-around use. It has a hinged grill that covers the photo-electric cell in normal light and may be turned back for readings in poor light. When the grill is off the cell, a "Low Light" scale appears on the reading side and enables the user to make accurate measurements in extremely dim light. The result is a working sensitivity of much greater range than has been possible heretofore. The Master is ruggedly built and compact, and will handle films both slower and faster than those in general use at present. If your dealer cannot show you the Weston Master, write to the Weston Electrical Instrument Company, Newark, New Jersey, for a descriptive pamphlet. Please remember to mention this department.

Agfa Ansco has brought out a new and complete working outfit for contact printing and tray development of negatives. It includes all the chemicals and equipment necessary for the work, and a copy of the booklet, *Developing and Printing Made Easy*. The set, nicely packed, sells for $9.75. For information address Agfa Ansco Corporation, Binghamton, New York.

We have recommended Defender's "Panthermic 777" developer before in these columns. We repeat those recommendations for uniformity of results, long life, fine grain, and splendid tone quality at any developing temperature from 60 to 90 degrees, and call your attention to the recently announced reduction in price, from $3.00 to $2.00 for the standard quart package. For full information write to The Defender Photo Supply Company, Inc., Rochester, New York, mentioning Camera Trails. If you wish a trial package for one roll of film, send 15c with your request for it and the data.

The new Ikoflex III just announced by Carl Zeiss seems to be a real improvement in twin-lens reflex cameras. It is fully automatic in all its operation with the movement of a conveniently-located lever winding the film and setting the shutter. The eye-level view finder is corrected for parallax so that nearby pictures may be made with the assurance that the 2¼" x 2¼" negative will include exactly what appears in the finder. The focusing ground glass shows the most brilliant image we have seen in a camera of this type, and the focusing is quick and simple. If your dealer cannot yet show you the details of the Ikoflex III, write to Carl Zeiss, Inc., at 485 Fifth Avenue, New York, and mention this department.

A good watch with a second-hand is invaluable for the Nature photographer in making time exposures and in the dark room. A stop-watch is even more helpful since it allows us to start the timer and the operation at the same time with consequent lessening of error. A series of fine watches with or without the "stop" feature, is offered by the Aristo Import Company of 630 Fifth Avenue, New York City, who will send illustrative material to any reader of Camera Trails. Please mention us when writing for your copy.

Camera wiggle is one of the most frequent causes of unsharp pictures and, at the same time, one of the easiest to overcome. A tripod is inexpensive and the modern variety is light and compact to carry. If you do not regularly use one or the one you have is too clumsy and heavy, write to Burleigh Brooks, 127 West 42nd Street, New York City, for their circular describing the Bee Bee line of American-made metal tripods for every purpose. Don't forget to mention this department.

If you keep a lens cap on the lens of your camera—and it is mighty good business unless the front surface of the lens is well protected in some other way—look out for "sweating" if the cap has been in place for some time. On a recent hot day when the humidity was high, we missed a shot because of the moisture that had collected.

Camera Trails is operated for the benefit of its readers and it is the sincere wish of its conductor that every Nature photographer will find in these columns the information that will be of greatest aid to him. This will best be accomplished if you will express your opinions freely both as to what has already appeared and as to the subjects you would like to have discussed. We will also be happy to answer any questions on photographic problems. Address your welcome communications to Norris W. Harkness, Camera Trails, NATURE MAGAZINE, 1214 Sixteenth Street, N. W., Washington, D. C.

●

Tulip Movie

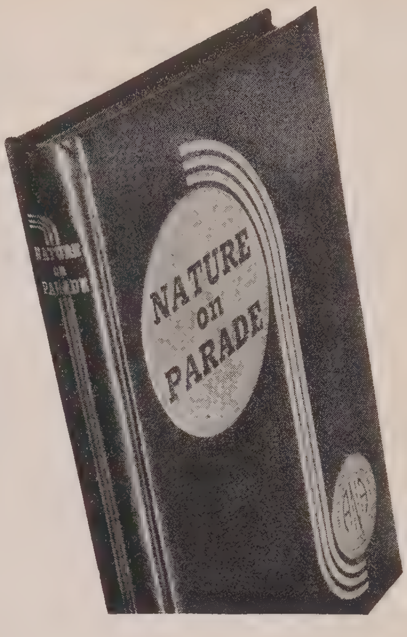
One of the most remarkable collections of tulips was that displayed this spring at the New York World's Fair, both in Gardens on Parade and in the beautiful plantings throughout the Fair grounds. A motion picture in technicolor has been made of this display and is available for showing before garden and civic clubs throughout the country. The film is 16 mm. and takes about 45 minutes to run. It is available for the transportation costs. A second film made at the San Francisco Fair is also available; in color but a little shorter. Write to the Public Relations Department, The Holland Bulb Industry, 630 Fifth Avenue, New York City, for reservation dates.

Photography Contest

The word comes to us, a little late, that the Pittsburgh Garden Center is sponsoring a garden photography contest open to everyone interested in photography. Space does not permit giving all the details of the contest, which closes December 6, 1939, but a stamped return envelope will bring the details and an entry blank. Write to Pittsburgh Garden Center, Schenley Park, Pittsburgh, Pa.

Persimmon Wilt Spreads

"Explosive" is the word used by the United States Department of Agriculture to describe the spread of persimmon wilt, a fungus disease discovered and identified only two years ago. It is spreading with alarming rapidity in the southeastern states, destroying a tree that furnishes winter food for wildlife and wood for golf club-heads and shuttle blocks used in woolen mills. Methods of control still elude pathologists, the development of wilt-resistant trees being the only present recourse.



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IN THIS ISSUE

Cover Design . . . . . Rosalie Rees
Camera Trails . . . . . Norris W. Harkness 418
Indoors and Out . . . . . Howard Zahniser 423
Sea Otter—Past and Present . . M. F. Murphy 425
Sequel (Poem) . . . . . Oscar Ostlund 428
A Short Visit with Mr. and Mrs. Plumbeous B. Gnatcatcher . . . . . Laurence M. Huey 429
To A Mocking Bird (Poem) Patience Marshall Leaver 431
The Garden of Eden . . . . . Robert Clark 432
To the Rescue of the "Desert" . Eugene R. Guild 433
Lamp Shells . . . . . C. S. Gwynne 436
Tips on Tulips . . . . . Adolph Kruhm 437
The Escape of Sammy Cecropia George A. Smith 440
The Story of Woolly, A Flying Squirrel Karl H. Maslowski 441
Some Common Rocks and Minerals E. Laurence Palmer 445
Spying on the Grass Spider . . . Milo R. Clare 453
Conservation Editorials 457
"A Soft Answer . . ." . . . . Bertha Conrad Hall 459
The Kookaburra . . . . . Edith M. Laing 460
Things to Think About 461
A Hallowe'en Brew 463
Origin of Primitive Indian Paints Proved Charles G. Burdick 465
A Catbird Friend . . . . . Elizabeth B. Hartshorn 465
October's Skies . . . . . Isabel M. Lewis 466
The Living John James Audubon Paul H. Oehser 468
Pine Barrens, Home of the Pyxie Warren C. Wilson 469
The School Page . . . . . E. Laurence Palmer 470
Under the Microscope . . . . Julian D. Corrington 478

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Indoors and Out

By HOWARD ZAHNISER

Not long ago I had the pleasure of viewing a reel of motion pictures taken by C. Gordon Krieble of the Pennsylvania Game Commission, photographs in color of scenes at the Pymatuning Refuge. In August the colors seemed almost incredibly beautiful, but the photographer had done his work in October, and belief followed memory, provoking anticipation. These were pictures of waterfowl, but the birds were flying against a background of misty foliage of many colors—October and the migratory birds.

It would be hard to tell how much the "something in October" that "sets the gypsy blood astir" depends on the migrating birds. It has been true as far back as we know that men have been concerned with the migrations of birds, explaining their concern in varying ways. Back of all the explanations is perhaps the intangible human wonder at the ways of Life, in which man shares. The Federal Government of these United States has itself long been a student of bird migration, using its findings in conservation activities and in other administrative ways that provide the inescapable justification of expense, yet satisfying a high order of curiosity and conducing to an effectual wonder to such an extent that other justifications seem necessary in only a perfunctory way.

Frederick C. Lincoln, who directs these studies for the Federal Government, has recently summarized the results in a book published by Doubleday, Doran & Company, Inc., *The Migration of American Birds*. It is one of those works that when once available soon become indispensable. Following in the tradition of Wells W. Cooke, "the father of bird migration studies in America," who studied and published during a lifetime in the Bureau of Biological Survey, and of Alexander Wetmore, who ten years ago surveyed the field and discussed hypothetical causes and implications in *The Migrations of Birds* published by the Harvard University Press, Mr. Lincoln has written a book that seems essential to those who study birds and commendable also to general readers for its pleasant and understandable discussion of scientific knowledge about a fascinating phenomenon.

There are few North American birds that do not migrate, the apparently resident birds being listed by Mr. Lincoln as "the bobwhite, the western quails, the cardinal, the Carolina wren, probably the wren-tits and some of the titmice and woodpeckers." Among the other species, surprisingly enough, it would be possible in our northern States, as Mr. Lincoln points out, to observe some migration throughout almost the entire year. The mass flights in fall and spring can not escape attention of even slightly alert observers of the skies above them, but migration students have their subject almost constantly before them.

In addition to his own extensive field studies, Mr. Lincoln has long had the advantage of his position in the Biological Survey, where he supervises that Bureau's work of coordinating and maintaining permanent records collected by many observers throughout the country. Outstanding in recent years among these studies has been the banding of birds. Bird banding makes it possible to know the migrations of individual birds. A numbered aluminum band is attached to the leg of a bird. The record is sent to Washington. When the bird is retaken, another record is sent to Washington. Thus reliable data are accumulated. Besides eye records of many observers, the Biological Survey's incomparable bird-migration files now include records of 3,284,142 birds.

The Migration of American Birds, however, does more than cite and summarize these records. Mr. Lincoln includes an historical discussion that traces recorded observations back for more than 3500 years. He does his best to correlate and cast new light on the various theories of the beginnings of migration and the evolution of migration routes. He explains the mechanics of migration, the influence of the weather, and the times and distances of the birds' migratory flight. He gives special attention to the concept of four major flyways on this continent, a concept that he himself has developed and one that has been helpful to the Government in administering the affairs of the migratory birds. A 31-page list of bird-banding records provides a wealth of example and ample material for the working of one's imagination. Twenty-two maps and twelve color plates by Louis Agassiz Fuertes illustrate the book. There is an index but unfortunately (to me, at least) no bibliography.

One of Mr. Lincoln's most interesting chapters, on "The Dangers in Migration," which points out that storms are probably among the worst hazards, but that lighthouses and other aerial obstacles cause wholesale destruction, calls to mind another recent book that observes: "The annual slaughter at the lighthouses is terrible each spring and autumn, and I have often thought that man, who puts up such lights for his own safety and causes this enormous mortality among birds, should do more than he does to minimize it." This book, *I Know An Island*, published by D. Appleton-Century Company, is by R. M. Lockley, who practices in the British Isles this same study of migration through bird-banding, called "ringing" in Britain.

Mr. Lockley, whose motion picture work and radio talks for the British Broadcasting Corporation have demonstrated his ability to arouse general interest in scientific knowledge, has written the most interesting book that I have read in a long time—a "romantic" record of human experience in which the outdoor observations that made up much of the richness of the experience are delightfully shared with the reader. The title, *I Know An Island,* is a rare and most outstanding example of understatement, for there seems to be no island, large or small, around England or in the North Sea that Mr. Lockley does not know well.

Leaving an inland farm where he lived after his schooling, Mr. Lockley settled on the (Continued on page 471)

SEA OTTERS WERE THE RUSSIANS' BEAVERS OF THE SEA—*BOBRY MORSKOI*—
HIGHLY PRIZED BY CZARIST NOBILITY AND IN GREAT DEMAND

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: and Present

ammal of northern seas

JRPHY

ıce Horsfall

the vast plenitude of most species apparently undisturbed by the minor demands of the Indians. Throughout the period of exploration and settlement that followed the advent of the first whites, all wild creatures faced a scourge that swept their kind toward either numerical decimation or total extinction, tragic to contemplate. Fin, fur and feather faced death. The holocaust continued until present times, when in California, as elsewhere, the survival of a few remnants of wild life may be attributed to the sagacity of certain species or to the inaccessibility of their retreats.

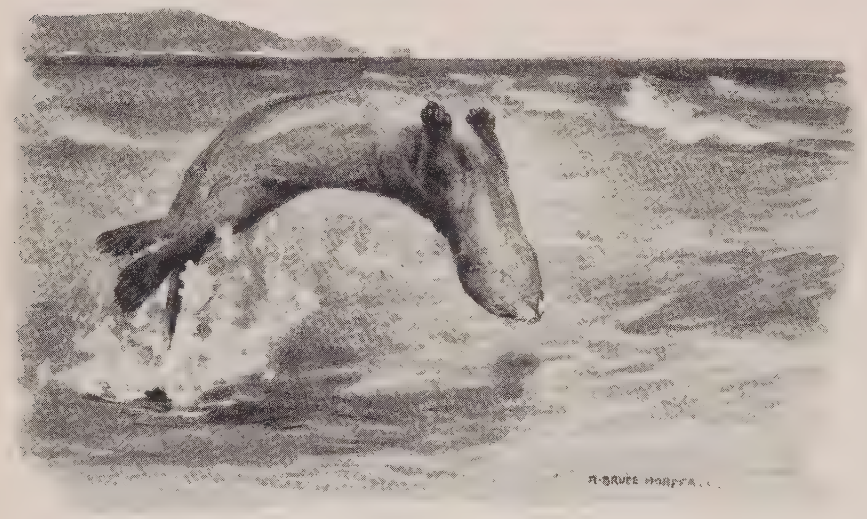
How fared the sea otter on our coast? This mammal was hunted for his prized pelt so diligently that his extermination was predicted at the time of the forty-niners. Russians, prior to the arrival of gold-seekers, working south from the Aleutian Islands, had followed and persecuted this peculiar animal so relentlessly that all avenues of retreat were seemingly closed. Sea otters were the Russians' beavers of the sea, *bobry morskoi,* highly prized by their nobility and in great demand. It is probable that Russia considered the sale of Alaska to the United States in 1867 good business and good riddance. Few realize however, that the rapid depletion of sea otter herds was the obscure but principal reason underlying the relinquishment, for a mere pittance, of Alaskan claims by the Russian Empire.

After the Russian colony departed from their most southerly outpost, Fort Ross, located about one hundred miles north of San Francisco, the American fur seekers, so it was thought, during the period 1850 to 1870, administered the final *coup de grace* to the sea otter trade. Reliable records indicate that the fur trade, a highly lucra-
e business of earlier years, had dwindled there by 1874. ı otters, the pursuit of which formed the backbone of ; fur trade on the coast, were then so scarce that the nters sought other means of livelihood.

Authentic data of the eighties and nineties are far too meager, and fail to make much mention of sea otters, except perhaps to note that the animals wore excellent pelts and were, as a consequence, highly prized. During the past three decades, it was believed that the coastal region of California might still serve as a home for a few stragglers from the once great herds of this remarkable animal. If a few otters did exist, such knowledge was sheltered in mythical legend or shrouded in dark mystery. However, in 1913, the state of California passed a law giving the sea otter full protection, with severe penalty for transgression. Subsequent to the passage of this protective provision, scant information reached the general public relative to the existence of the rare sea otter in coastal waters of California, although Bailey, in 1936, ventured to say that a few might be left on the coasts of Washington and California. Interest in the life and habits of this strange animal on the part of the public was almost dormant.

The electrifying news then broke. In the spring of 1938 a thriving colony or herd of sea otters was discovered near the mouth of Bixby Creek, in Monterey County, about fifteen miles south of the town of Carmel. In a cove guarded by precipitous cliffs and headlands, and about two hundred yards off shore, unconcernedly disporting in the kelp beds that restlessly rise and fall with Pacific swells, approximately eighty members were counted. No time was lost by the writer in seeking a vantage point from which to view first hand the rare mammal that had appeared from nowhere, risen indeed as if from the dead. For many hours, which passed like so many minutes, it was the good fortune of the writer to observe them closely.

Notley's Landing is now in ruins. A few scattered beams, shakes and scraps of metal remain to mark the spot where oak tanbark was trolleyed to waiting ships beyond rocky shores. Three hundred yards northwest of the old landing, with the aid of powerful glasses, I saw my sea otters. They had moved about a mile north of the original point of discovery. Heavy growths of kelp rose and fell in the ocean swells. This kelp has a tendency to calm rough waters, so dense is the mass. A certain type, known as sea otters' cabbage, has a bulbous head, or bladder, usually crowned with a bunch of ribbon-like banners. The bulbs or cabbages are yellowish-brown. Sea otter heads are yellowish-brown, and the two are similarly shaped. Together cabbages and heads rise and fall with the ever present swells. No better example of camouflage exists. Protective coloration, movement and outline are remarkably similar. Keen vision is necessary to spot the otters and as a consequence, satisfactory photographic results are extremely difficult to obtain.



"PORPOISE-LIKE THEY LEAP CLEAR OF THE WATER, ROLL ROUND AND ROUND, FLIP WATER IN THE EYES OF PLAYMATES, SIMULATE BITING AND ROUGH ONE ANOTHER ABOUT."

Through cresting wave and surging swell sea otters scoot like seals. Porpoise-like they leap clear of the water, roll round and round, flip water in the eyes of playmates, simulate biting and rough one another about. They are charged with boundless energy and may be listed with the most active marine creatures that live. Rest periods—and how otters do relax at recess time—are spent floating along, as it were, belly up, the stubby front and rear legs continuously pawing at the air. The sea otter at rest resembles a human infant reclining on its back in a crib, fingering the mysterious toes. Asleep, they appear like bloated gunnysacks of utter shapelessness. To provide indolent buoyancy as the animals sleep, much air is probably retained in the lungs. At play, one never ceases to smile at the clownish mannerisms of these quadrupeds, or marvel at their complete mastery of a habitat that should be the home only of creatures possessed of fin or flipper.

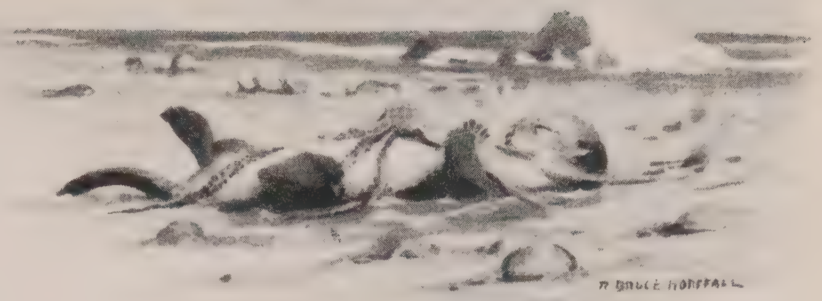
Whosoever learned to swim at a tender age will be captivated by the antics of sea otters. The man, who as a boy, dove, fetched, treaded, "chawed beef" and floated about in the old swimming hole, will be fascinated by the activities of these animals. Active participation in the rough game of water polo is the nearest that man can approach to a simulation of the riotous antics in which these bearers of such choice pelts indulge. They do everything man can do in the water and more, so much more. The land otter is noted for his mastery of fresh waters, but the sea otter fears not the briny curling breaker or smack of dashing spray. He laughs at the storm gods.

Unlike the seal, the rear legs of the swimming otter do not execute the true flipper movement. There is no intermittent side thrust and glide. Flipper-like in appearance the rear legs may be, and they are carried listlessly as such when the animal is at rest, but when action is demanded, either in search of food or to escape from danger, the otter turns belly down and the rear legs move vertically at right angles to the body. The movements are rapid or slow as occasion demands. The arcs then described, as legs are forced directly backward, are very similar to those employed by the arms of the human crawl swimmer. Human hands with fingers pressed closely together are cupped for the power thrust, but the sea otter spreads the toes of his hind feet as far apart as possible and large webbed scoops result. Excellent pushing propelling members are therefore provided, the possession of which any swimmer might envy. The follow-through is duck-like, fascinating to see and provides remarkable power. The recovery is of course completed entirely under water. Action of the front legs as the animal swims about is identical, but the chief functions of these two limbs are to provide balance and rhythm with resultant grace.

Sea otters are very gregarious, in that they exemplify the highest ideals of the "happy family". Occasionally a few reckless ones detach themselves from the main herd and play or seek food within even twenty-five yards of shore. To watch them then is a great privilege, one which indeed affords rare opportunities for study and entertainment. To one interested in details of sea otter life, and if opportunity presents, it is suggested that efforts be made to observe the creatures from the steep cliffs that abound near their home. It is remarkable how near one may approach their playgrounds, provided the stalk is carefully performed. There seems to be little danger of a sudden departure to other and remote feeding grounds, if they are unmolested by human vandals.

In North America, sea otters, according to authoritative information now available, once ranged from the Aleutian Islands to Baja California. It is recorded that the Kurile Islands north of Japan were favorite hunting grounds for early sea otter hunters. Thousands of pelts

"ASLEEP, SEA OTTERS APPEAR TO BE BLOATED GUNNYSACKS OF UTTER SHAPELESSNESS"



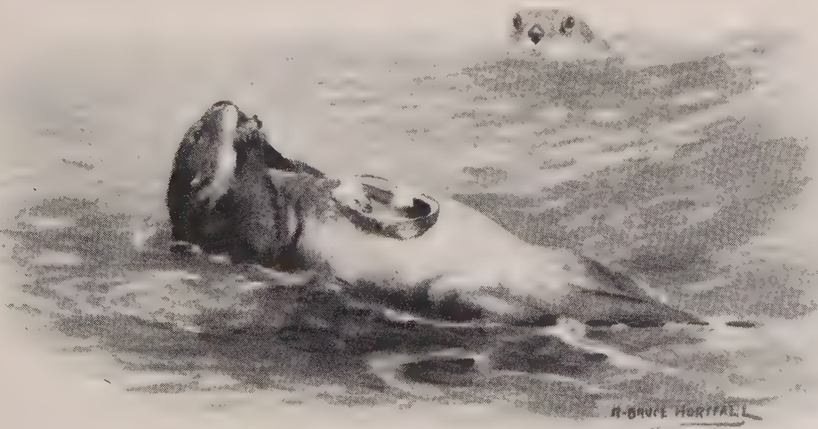
were gathered yearly. From 1799 to 1802, more than 12,000 furs reached Canton, China. Russians alone killed 15,000 annually for a period of five years and authentic record exists of the sailing of Baranof from Alaska in 1804, with a cargo of 15,000 units. What matter if spoilage ruined a portion of the shipment, or if such portion was crudely prepared and poorly handled in slow transit of the times? Standard price tags of early days are not available, but in 1870, an otter pelt was worth $50. Ten years later, pelts were worth from $100 to $150 each. In 1910, the London price was $1700. During the year 1916, when but single individuals were rarely sighted, sea otter pelts commanded fancy prices ranging from $1500 to $2000 each.

The full grown sea otter may reach five feet in length. This dimension includes the blunt ten-inch tail. The animal possesses full, black piercing eyes, set in a head resembling closely that of the fur seal. The ears are less than one inch in length, erect, pointed and covered with short hair. The fur is silvery-brown superficially, sprinkled with long glistening hairs that extend beyond the main nap of the coat. The inner coat is liver brown, almost black and of very dense texture. Sea otter fur is very durable. The beauty and richness of the pelt are most exquisite, and defy accurate description.

It must be emphasized that rarity alone has not boosted the price of sea otter fur. In the matter of comparison: nobility may demand ermine, the wealthy may seek the perishable chinchilla, but the coat of the sea otter far surpasses these and all other fur-bearers. He was clothed by Nature with surpassing pelage to offset rigorous conditions of wave, wind and chilly ocean waters. All members of the weasel family are fortified with lustrous and sturdy encasements and the sea otter is no exception. When the creatures were numerous, many of the early fur seekers considered the coat of the sea otter the finest of all furs. Contrary to modern methods of marketing with many a subterfuge in handling, there was never a time when dyes were needed to falsify, or application of spurious name necessary to increase, sales of sea otter fur. The demand for the coats of *bobry morskoi* was great even during earlier times and only simple preparation for the art of the furriers was required.

The sea otter seems to have no definite mating season and the pups are brought forth on the kelp. One authority has set the period of gestation at from eight to nine months. This statement may be regarded only as approximate, so difficult it is to observe such intimate characteristics. A single pup is usually born, but mothers with twins have been sighted. The birth of more than two pups is unknown. It was generally believed by hunters that sea otters mated for life, but here again there is no positive proof to substantiate the early fur seekers' assurance. Attempts have been made to make pets of captured sea otter young, but all have ended in failure. The captives refused to take nourishment and perished. The mothers caress and suckle their young with much affection, uttering the while a soft plaintive cry. Otter hunters often claimed that the female sang her offspring to sleep.

The rear feet of the sea otter are webbed and armed with five sharp claws. The front feet are similarly equipped, and the legs, both front and rear, are short to the point of being ridiculous. The peculiar habit of apparently shading the eyes with the front paw from the glare of the sun is especially noticeable. Being very gregarious, the animals have a marked tendency to collect in herds of fifty to hundreds. The power of scent is remarkably developed, but this sea-going quadruped is as curious as the antelope. The food of sea otters consists of



"THE SEA OTTER AT REST RESEMBLES A HUMAN INFANT RECLINING ON ITS BACK IN A CRIB . . ."

clams, crabs and other marine invertebrates. Small rock cod and other fish are also eaten, but the sea urchin is the prized food morsel. When food is brought up, the creature turns over on his back and dines at leisure, using the front paws in the same manner as the raccoon. Bits of food are tossed into the air and recovered with the paws or mouth, for the sea otter must eat and play at the same time.

The Indians obtained their otter pelts by spearing, or through the use of darts, as the animals slept. They were also netted and clubbed, but the most deadly method of capture was employed when the otters were followed in boats by Americans and Russians and killed with rifles. A special otter canoe, adaptable to surf and rough sea, was used. When a large herd was sighted, eight to twelve otters were dispatched before the main herd dispersed. Sea otters were also shot from shore, but whether killed from boat or shore, the bobbing head presented a difficult target to the rifleman. When alarmed, the sea otter rose half length from the water and, if danger threatened, immediately submerged. The under-water swim probably averaged forty yards. The mothers grasped the young with the mouth and dove. The pups wailed protest of the all too frequent duckings as the frantic parent sought, by means of repeated dives, to escape with her prized darling. It is not difficult to picture the piteous efforts of the female sea otter diving again and again to escape the cruel persecutors.

Sea otter hunters have noted that, if mortally wounded or killed outright, the animal, without appreciable surface struggle, sank immediately toward the bottom. Kanakas, noted for proficiency in water, were often kidnapped from the Sandwich Islands by the whites, to retrieve the submerging carcasses. The sea otter being an expert diver, it is therefore reasonable to assume that his last act for prolongation of life would naturally be an instinctive movement toward the depths that never failed to shelter him when danger threatened.

Kelp beds, which otters must frequent for food and shelter, occur frequently from Monterey to San Luis Obispo, a distance of approximately one hundred miles. A fine expanse of this marine growth is present in the cove of Big Creek, just north of Gamboa Point. It is possible that another colony may be discovered by sharp-seeing eyes in this, or some other mass that mats a coastal indentation somewhere along the vast coast line that stretches from Baja California to the Aleutians. A recent otter census, conducted by the Department of Natural Resources of California, reveals a number that approaches 300. The shore waters of Monterey and San Luis Obispo counties produced this surprising result. North of San Francisco Bay, sea otters' cabbage heads bob about in the coastal regions of Sonoma and Mendocino counties. The possible discovery of the "sea beaver" near the mouth of the Russian River, old Fort Ross, or Point Arena, would bring joy to the heart of any lover of our disappearing wildlife.

An elusive atmosphere hovers over the historical background of the Golden State, wherein the sea otter has carved for himself a secluded but imperishable niche. Although printed pages fail to allot justifiable space to this fur-bearer, his influence on historical events of the entire west coast of North America was very important. What favors of fair lady won, what drownings, killings, tragedies and scandals, each interwoven with the sea otter fur trade—all but one are unrecorded. Considered among the greatest romances of all time, tragic enough to inspire the pen of Bret Harte, the love tale of Count Nickolai Rezanof and the lovely Spanish maiden "Concha" (Dona Concepcion Argüello) ranks as a classic, often retold, and based entirely on fact. Were it not for the merciless pursuit of the sea otter, these two would never have met.

It is fitting that the sea otter has chosen as a threshold the vicinity of Monterey for his stealthy return to the home of his ancestors. The town and its environs reek with romance and tradition. Peace now reigns where Padre Junipero Serra sleeps, and the cypresses of Point Lobos have taken on a deeper mossy green. Fogs creep silently over artichoke fields of the Carmel Valley, and the redwoods of Palo Colorado murmur a welcome in their lofty fronds. Vantana Cone and Pico Blanco rejoice from rugged summits. The clan of *bobry morskoi* has come home.

Now that a happy and healthy colony of rare sea otters has reappeared, it should be the aim of all lovers of wildlife to cherish and protect from ever-threatening extinction this or any other remnant of the great herds that formerly splashed about in the blue-green waters of the Pacific. The discharge of firearms within sound distance of Notley's Landing should be prohibited and nothing should be left undone to encourage increase in any sea otter herd now existent. No one will doubt, from an esthetic standpoint alone, that the pursuance of a normal life by the rare sea otter is of great moment, and concerns all. Regardless of the huge price his pelt may bring, complete destruction of his kind because of personal greed or desire for selfish adornment would surely be tragic. Wanton waste and unbridled killer instinct have wrought far too many deplorable calamities to our wildlife resources in the past. Conservationists should all rise and chorus, "Long live the sea otters—the Russians' sea beavers—*bobry morskoi!*"

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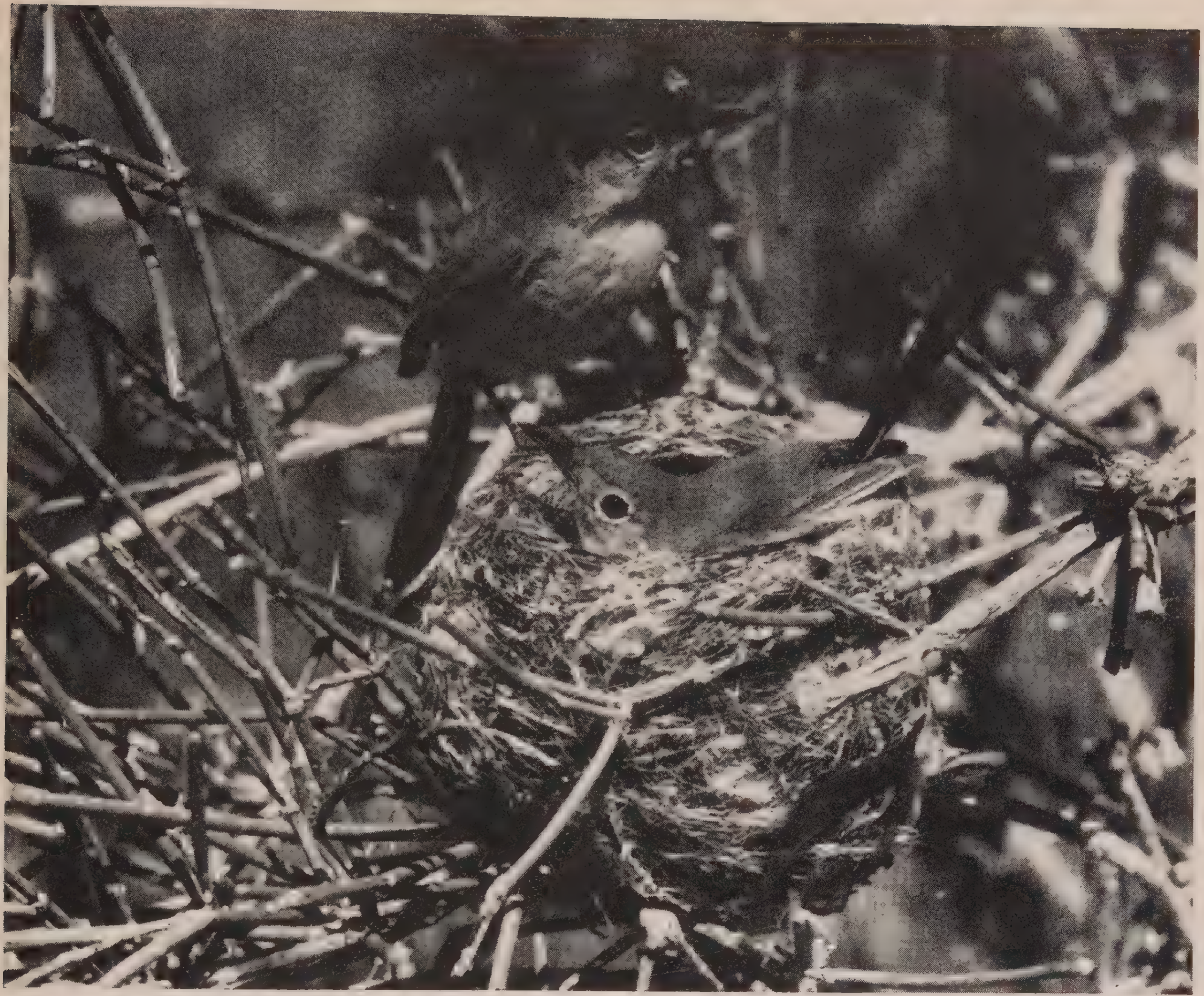
Sequel

By OSCAR OSTLUND

The shooting is over, and, as the hunters go,
Clouds open, quietly, and rain begins to pour;
Clean water falls on ridges, stained by gore;
A mild rain laves the burning wounds of doe.



A SHORT VISIT WITH MR. AND MRS. PLUMBEOUS B. GNATCATCHER

By LAURENCE M. HUEY

Photographs by the Author

IT WAS on a calm bright sunny morning in late April. I was slowly searching through the low desert shrubbery on the northeastern face of Crossman Peak in the Chemehuevis Mountains of central western Arizona, my objective the nest of a desert sparrow.

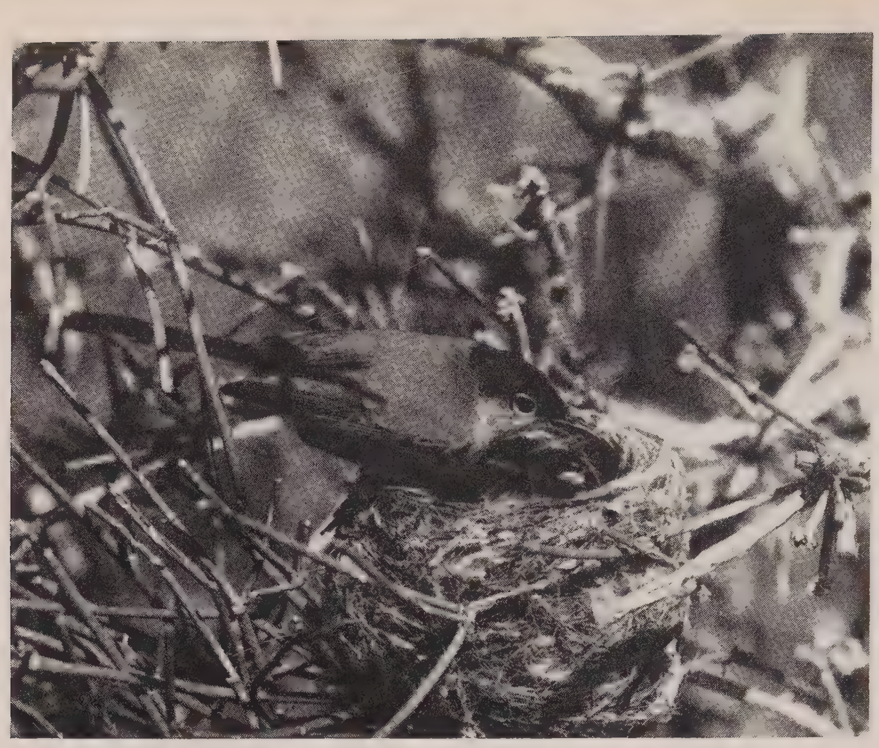
A Scott oriole was serenading his mate with a clear musical song from his favorite perch atop a yucca on the ridge. Nearby a pair of Mearns gilded flickers and a cactus wren announced their presence with their different songs. The air was vibrant with the desert spring season.

Several pairs of black-throated desert sparrows and a pair of canyon towhees were known to be living in this particular section, although they seemed unwilling, at the moment, to let me in on the secret of their home sites. Also, as seems always to be the case with such quests, the more diligently I searched, the more silent were the sparrows. They seemed to sense that they were the object of pursuit, although my objective meant them no harm.

Suddenly I heard the "*chee-chee*" scolding of a plumbeous black-tailed gnatcatcher. I had invaded his territory; he resented it and did not mind saying so. He was a tiny fellow with a glossy black cap on his head. His white-bordered eyelids stood out in bold contrast to his slate-blue back and black head dress. This black cap is the nuptial bonnet of the males of the black-tailed gnatcatchers and is worn by them only in springtime.

To say the bird was shy would be untrue, but he was tiny and could flit through the brush like a mystic elf. So well did his color of drab slaty-blue protect him in the bright shadows, as he journeyed through the rather open brush, that often I lost sight of him, even with the brilliant desert light to favor me.

After his first excited alarm, at the moment of our meeting, he led me, almost in a direct line for nearly fifty



FATHER TAKES HIS TURN AT THE NEST, AND ALWAYS WITH A PRELIMINARY FLOURISH

yards, to his dainty little nest of shredded plant fibre adorned with bits of white silk web of spider egg sacs.

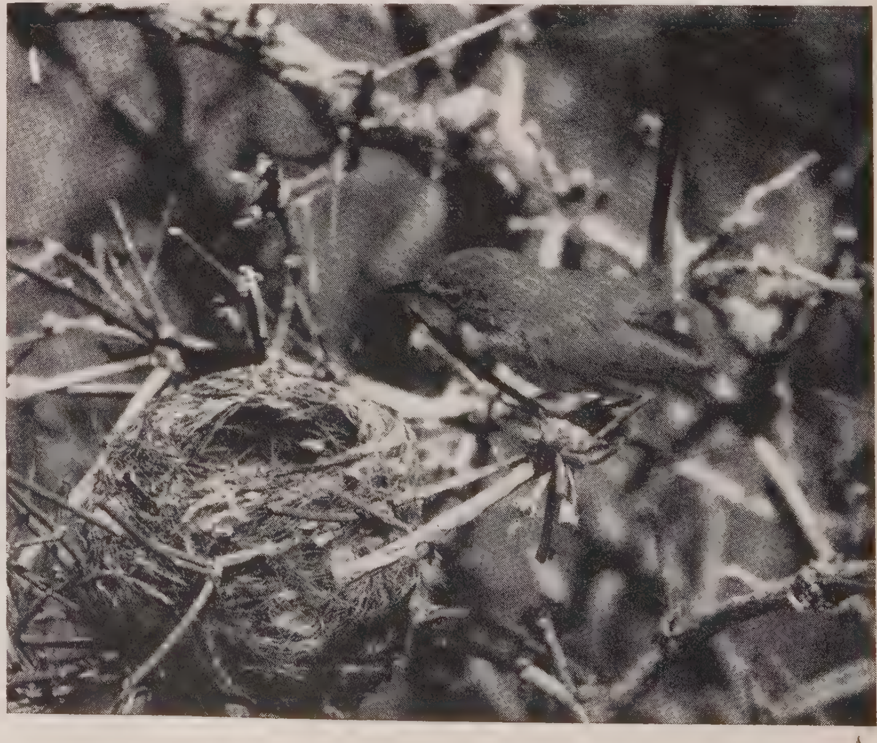
The beautiful cradle was nestled in the small branches of a squaw tea bush about two and one-half feet above the ground, and in a rather exposed position on the southeast side of the shrub. It was ideally situated for photographing, and Mrs. Gnatcatcher was at home too. She seemed loath to leave her treasures, and did so only when my hand was within an inch of her back. Four small, bluish, dotted eggs lay in the bottom of the deeply-cupped nest. Fine speckling covered the entire surface of the tiny elliptical eggs, but this was heavier on the larger ends and gave them a wreathed appearance. Close examination revealed the eggs to be near the point of hatching. Both birds were extremely perturbed about my presence, "*chee-cheeing*" loudly as long as I was near.

I had moved away only a step or two when Mr. Gnatcatcher popped on the nest. Incubation was the business of the day and it was his turn, visitors or no visitors.

Studying the photographic possibilities carefully, I decided that mid-morning light was best, so I marked the spot and made definite plans to return with proper equipment at the right time. The next day I approached the nest with some trepidation. Suppose—but my fears were soon allayed, for little Mrs. was at home and no harm had befallen the diminutive pair during the night. Often I have found that wandering enemies will follow the human trail and so discover nests that have been examined, and left for a future visit.

With my camera about six feet from the nest, I focused it, stretched a thread back to a vantage point, inserted a film holder, and left to take my place and await the incubating bird's return. She had left the nest when I began setting up the machine.

When several yards away I looked back at the nest. Behold, there sat the Mrs. smugly at home and looking right at the lens. I gently pulled the thread, the shutter clicked loudly, but she would not leave the nest again. She had duties at home. Even when I carefully went to the camera, replaced the slide and turned the film holder over, making several sharp clicking noises in doing so, this did not frighten her from her nest. Here was the chance of a lifetime. I made four pictures, and then decided that perhaps Mr. and Mrs. Gnatcatcher would stand for some real gnatcatcher portrait studies. So the camera was moved up to a position three and one-half feet from the nest. The subject almost filled the plate, I was so close to the birds.



THE FEMALE SEEMED, WHEN APPROACHING THE NEST, ALWAYS TO HOLD HER TAIL IN A VERTICAL POSITION

The birds *"chee-cheed"* about this move for a minute or two, then Mr. Gnatcatcher took over the setting job with an air of bravado, as if to show his lady that he wasn't afraid. I decided not to go far away either, and sat down back of the tripod and made my pictures with a three-foot piece of thread.

For the next couple of hours I watched every move they made. The regularity of time that each bird spent incubating and foraging was remarkable. During this session I clocked them, and in a shorter period, two days later, the same program prevailed.

In some habits the two birds were quite dissimilar, in others much alike. The male bird always came to the nest by way of a nearby bush that was slightly taller than the one that held the nest. He proclaimed himself with a thin *"chee chee"* song from an elevated twig. He would then drop down to the nest, perch a moment near it, salute the female with song as if to say, "Here am I, now you may go." She needed no more coaxing and always departed without further ceremony. Both birds, when they left the nest, almost without exception flew directly away.

Her return was unheralded, she simply hopped up from the lower part of the nest bush and looked the situation over from a certain twig near the nest. Never a sound of greeting! That look seemed to have some positive command, for Mr. Gnatcatcher always relinquished the post without delay or argument. On two occasions Mr. Gnatcatcher, during his forage period, returned to inspect the underside of the nest. It was his duty to keep the home in repair. There seemed to be something wrong with the bottom and he was trying to mend it. This was probably caused by the hulking human intruder when he removed a small branch that was casting a slender shadow across the nest. Once the male brought in a prize spider nest and with much vocal announcing he placed it on the outer side of the structure.

The male bird always incubated longer periods than did the female. This gave her more time to feed, thus building up her strength after her effort of laying the clutch of eggs. His longest time away from the incubating job was twenty-five minutes and the shortest was seventeen, while the greatest length of time spent away from the nest by the female was forty-five minutes and her shortest was twenty. However, the least disturbance near the nest always brought the feeding bird back quickly, neither of them ever being beyond sight or hearing of home. They were without question the most devoted pair of birds I had ever seen.

The actions of both birds when on the nest were alike. After settling their tiny, fluffy, feathered bodies into the deeply-cupped structure, they would thrust vigorously with their feet, using them alternately. This act seemed to be the regular way of turning the eggs, and would be performed by each bird as soon as it took over the nest. Often, after a few minutes of close setting, the incubating bird would grasp the sides of the nest with its feet, rise and turn the eggs with its beak, but this was not always so.

A week after I had spent these pleasant hours with the gnatcatchers, and the day before my party moved, I returned to spend one last hour with my tiny friends. Four black-skinned, almost naked young were in the little nest, and a busier pair of parent birds I had never seen. They didn't appear to notice my presence but kept hunting food for their hungry young. As when incubating, the male came in with his squeaky song despite his beak being full of insects for his offspring, and the female still was silent when she came in with her burden of food.

Ill fared the moth that chanced to cross their path, for as I came up I happened to flush a small slow-flying one from a bush nearby. Immediately it was set upon by the male gnatcatcher and captured in mid-air.

This last hour was all too fleeting, and it was with reluctance that I bade farewell to this most interesting pair of gnatcatchers. As I left them, serenely happy on that desert mountain-side, I made for them a silent wish that they raise a grown-up family, Nature's crown of glory.

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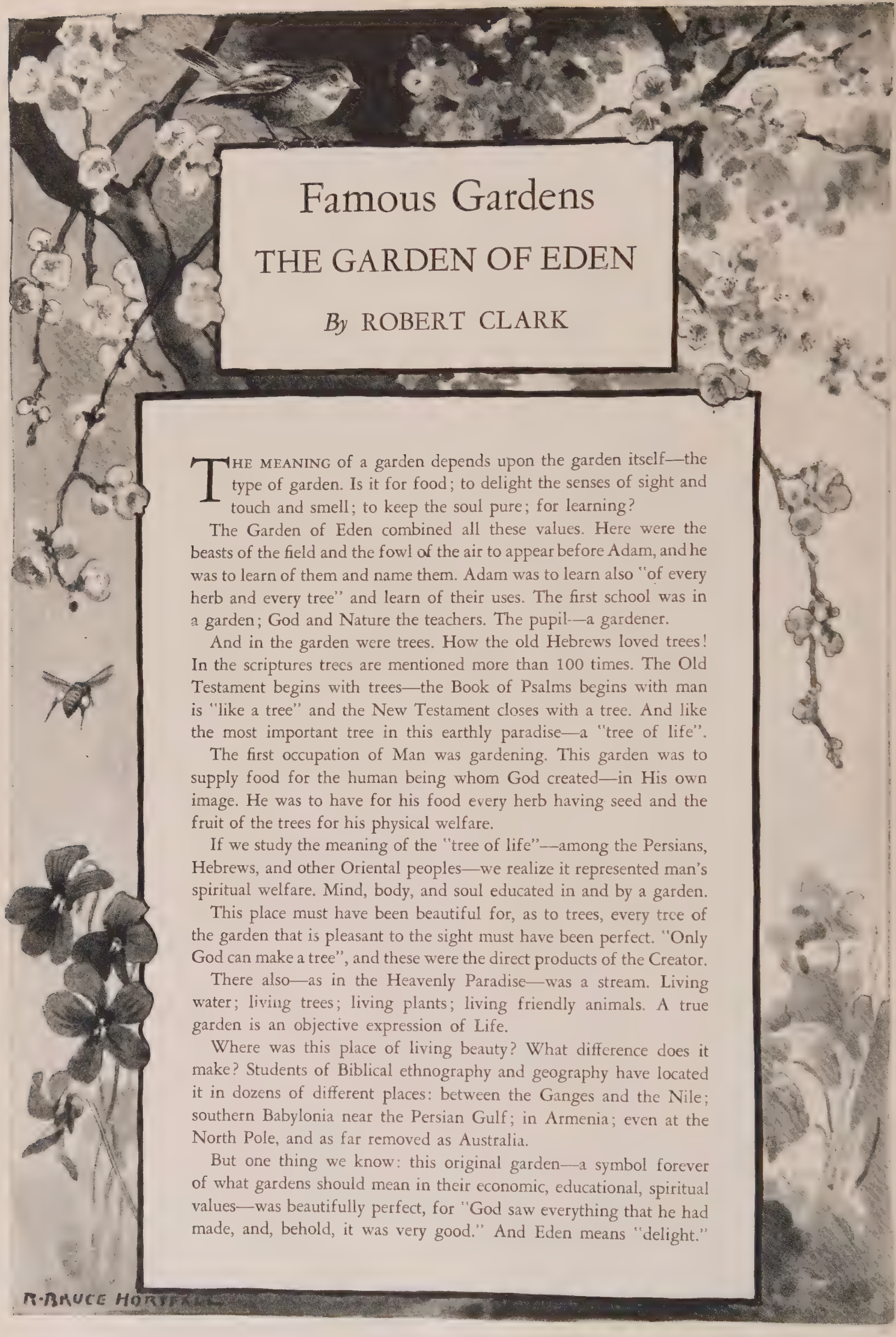
To A Mocking Bird

By PATIENCE MARSHALL LEAVER

When I hear you, Minstrel, singing,
When I hear you, Minstrel, flinging
Golden arias across a silvered world;
From a newly-blossomed bower,
In your matchless music shower,
Wistful, gay, or wild with rapture,
Each bird's song you here recapture
With an art above all learning,
Sprite with love and beauty burning.

When I hear you, Minstrel, singing,
When I hear you, Minstrel, flinging
Song enchantments, leaving ebon night impearled,
From a city tree, that's lonely,
Spendthrift there for men who only
Know of unimpassioned hours
In a maze of stony towers;

When no more the traffic thunder
Dims your caroling, I wonder
Do you show that joyous graces
Reckon not with times nor places?
Or is yours a heart that pities
Folk who cannot fly from cities?



Famous Gardens

THE GARDEN OF EDEN

By ROBERT CLARK

THE MEANING of a garden depends upon the garden itself—the type of garden. Is it for food; to delight the senses of sight and touch and smell; to keep the soul pure; for learning?

The Garden of Eden combined all these values. Here were the beasts of the field and the fowl of the air to appear before Adam, and he was to learn of them and name them. Adam was to learn also "of every herb and every tree" and learn of their uses. The first school was in a garden; God and Nature the teachers. The pupil—a gardener.

And in the garden were trees. How the old Hebrews loved trees! In the scriptures trees are mentioned more than 100 times. The Old Testament begins with trees—the Book of Psalms begins with man is "like a tree" and the New Testament closes with a tree. And like the most important tree in this earthly paradise—a "tree of life".

The first occupation of Man was gardening. This garden was to supply food for the human being whom God created—in His own image. He was to have for his food every herb having seed and the fruit of the trees for his physical welfare.

If we study the meaning of the "tree of life"—among the Persians, Hebrews, and other Oriental peoples—we realize it represented man's spiritual welfare. Mind, body, and soul educated in and by a garden.

This place must have been beautiful for, as to trees, every tree of the garden that is pleasant to the sight must have been perfect. "Only God can make a tree", and these were the direct products of the Creator.

There also—as in the Heavenly Paradise—was a stream. Living water; living trees; living plants; living friendly animals. A true garden is an objective expression of Life.

Where was this place of living beauty? What difference does it make? Students of Biblical ethnography and geography have located it in dozens of different places: between the Ganges and the Nile; southern Babylonia near the Persian Gulf; in Armenia; even at the North Pole, and as far removed as Australia.

But one thing we know: this original garden—a symbol forever of what gardens should mean in their economic, educational, spiritual values—was beautifully perfect, for "God saw everything that he had made, and, behold, it was very good." And Eden means "delight."

PHOTOGRAPHS BY GEORGE C. MASON

THE FRIENDLY TRAIL THROUGH THE "DESERT"

Dogwood blossoms and the needles of loblolly pine brushed the windows of the automobile as one drove slowly over the road that did not pretend to be a road but a wilderness trail

To the Rescue of the "Desert"

Popular sentiment saves Virginia seashore wilderness

By EUGENE R. GUILD

Some centuries ago, when the Atlantic Coast was advancing, a series of sand spits and dunes began to appear on the southern shore of the entrance to Chesapeake Bay. Line after line they advanced, as the sea receded, until a cape was formed—Cape Henry, it is now called.

As each new series of dunes was formed on the beach, those behind it became covered, first with beach grasses, then with bayberry and *Baccharis,* and finally with trees. As the cape reached its greatest seaward extent and then started to retreat, under the onslaught of the sea, a great dune, thrown up by the wind on its shore, started a slow march inland. Between this great curved sand hill and the shallow bays behind the cape, sheltered from gales from the sea as well as wintry blasts from the north and west, a wilderness grew up—a deep and quiet wilderness that has been known to Virginians since the time of George Washington as the "Desert".

In it are dark brown pools peopled with gnome-like knees of cypress. On the sand ridges are venerable oaks, hickories, beeches, gums and loblolly pines, bearded with Spanish moss. Because of its sheltered position, and also because it is surrounded by the tempering waters of the bay and sea, the climate of the Desert is that of lands far to the south. Humid and hot in summer, mild and quiet in winter, the Desert has brought forth an exotic flora. It is the winter home of many birds that usually do not stop, in their southern migration, at that latitude.

Orchids are plentiful; even one tropical epiphyte, a tree orchid, is to be found here. There are species of red-berried greenbrier that few people have seen, and the tree *Osmanthus americana,* sometimes called devil-tree, hitherto listed as not occurring north of Hatteras, makes its home here. There are many more to delight the botanizer.

The dense undercover provides food and nesting sites for an abundant bird life. It is here that local ornithologists journey to see the shy prothonotary warbler, and the hooded warbler. In addition to the small species, there are some large birds. A pair of great bald eagles make their home here the year around. In the tops of the trees may be seen the snowy egret and the Louisiana heron, as well as other species of this group. The wood duck, our beautiful tree-nesting swimmer, is at home. Even the brown pelican has been seen here on occasion.

The Desert, then, has been a mecca for botanists, ornithologists and Nature lovers in general from all parts of the country. In Tidewater, it has been for a century the familiar tramping ground for those with the seeing eye and the understanding heart, and the Tidewater women in particular looked upon it as a last small sample of Nature

SPANISH MOSS HANGS FROM THE TREES

Casual visitors saw no charm in the place because you couldn't see the forest for the trees

that was their charge to protect.

Through it for some four miles there wandered a pair of wheel tracks—wheel tracks in the pine needles and through the sand, with grasses and sometimes small plants growing between the treads. It was not a road, it was just a friendly trail. It had many friends who came as often as they could and drove through slowly, with many stops to see and hear what new things the trail had to offer each time.

The trail twisted and turned, and beyond each turn there was always a fresh surprise. It climbed over the forested, ancient beach ridges without ceremony or benefit of calculated gradient. Here and there were roots and tussocks that made for slow and considered driving. Ferns brushed the tires and dogwood blossoms reached into the windows. It was a friendly trail.

But there were some unbelievers, too, who travelled the trail. They grumbled because of its roughness and complained that there was nothing extraordinary to see. But they missed the very things the trail tried to give them. They wanted to go faster than the trail went. They wanted speed and smoothness, when all the trail had to offer was a tranquil, leisurely pair of ruts that never pretended to be a road, but nevertheless were a joy and delight to every Nature lover who had ever followed them.

Then the State took over the Desert, because scientists had called attention to its unique biological significance and had given it widespread fame. This, thought the friends of the Desert, was fine. Now there could be no exploitation, and Nature would be preserved unspoiled. They pooh-poohed the possibility that state officials might mistake biological significance for tourist-attraction value.

But they had not reckoned with Government "Conservation", with hordes of CCC boys, engineers, landscape architects, all eager to open up, clean up, rearrange and *denature* any area into which they could get their rakes and brushhooks. Nor had they counted on park experts to whom "park" meant one of two things: one, an area to be landscaped into the semblance of a cemetery; or, two, a site for picnic grounds, tourist cabins and trailer lots.

So the Desert was incorporated willy-nilly into the Seashore State Park, whose main function was sports recreation—bathing, boating, fishing and picnicking on the bay front. The Desert was advertised as an added attraction. Admission was charged, and a long line of tourist cars was shunted into the trail at twenty to fifty cents per car. The bewildered

FOOTPATHS WERE "ENGINEERED"

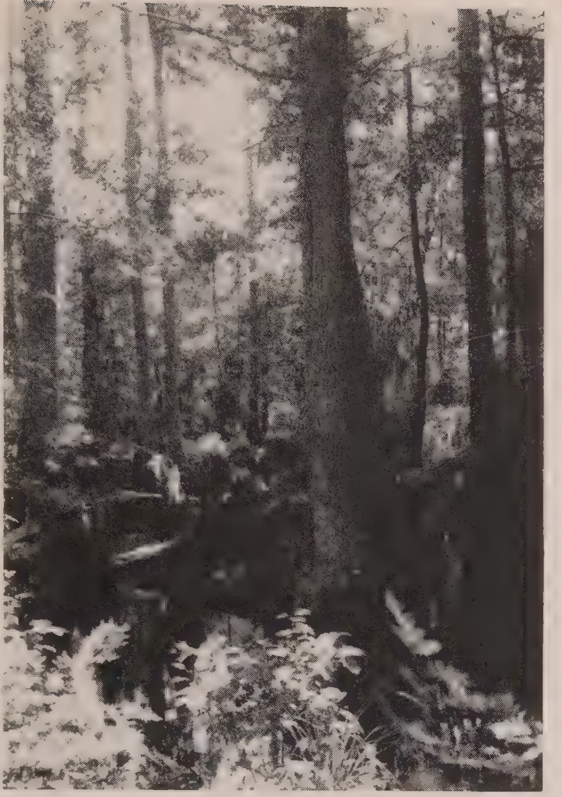
Trampers may now march in a column of squads. The "untidy" cover and shelter for birds was carefully landscaped away. Photograph by Borjes tourist, neither knowing nor caring what a prothonotary warbler was, nor what *Smilax walteri* looked like, drove the four miles at a snail's pace. His fenders were a foot from those of other tourists behind and in front of him. There was heat, there were fumes and dust, and nothing to look at except woods that looked to him like any other woods, except you couldn't see it very well because of the trees. To him biologic significance was a headache; ecological relations a total loss.

To the rescue came the National Park Service and the CCC, with a thousand dollars' worth a day of potential labor. A "proper" motor parkway should be built, two lanes wide, with the slovenly brush cut back seventy-five feet on each side, and the ground graded and planted to flowers—beds of flowers that a person could really see, not just a patch of ragged wild flowers here and there. So the park was closed and the work begun.

There was consternation among the women of Tidewater Virginia. What of the destruction of cover and food, the disturbance of ecological conditions for hundreds of yards on each side of the ravaged Friendly Trail? What of the spoiling of this wilderness for the Nature lover? Finally, what good would it do the tourist anyway—biological interest not being a synonym for sensational scenic value.

There was a rallying of groups of women in Norfolk and the old county of Princess Anne. A protest meeting was hastily organized by the Garden Club of Norfolk and others nearby. State Park officials attended, and stated that the great touring public must be accommodated with smoothly-working traffic roads, but that there was no greater lover of Nature than the Park Department, and that not one twig or blade of grass would be disturbed—unnecessarily. But underneath it all there was evident the usual, thinly disguised feeling that the members of Nature organizations were merely sentimentalists standing in the way of progress. Then, too, officials privately feared that if the road and clean-up project did not go through, keeping the CCC busy, the camp would be withdrawn.

Once out of the meeting, and with the women apparently pacified, the Park Department went back to the Desert, and laying aside its cloak of naturalist, went to work with falling axe, crosscut saw and bulldozer. The Desert resounded to the cry of "Timber-r-r-r" and the solid "thwack" of axes biting into dogwood trunks. Scores of shovels stripped the carefully hoarded woods litter from banks. Portions of the Friendly Trail were slashed open to the sky.



THE BAGGY KNEES OF CYPRESS WERE CLEANED

A man in a boat was employed to "improve on" Nature by removing plant material from them

So began the ravishing of the beloved Desert.

But the women had not relaxed their vigilance. Despite locked gates and "No Admittance" signs, they went into the Desert. They found workers felling the rare *Osmanthus,* others raking up the distinctive carpet of partridge-berry, which the park officials spoke of as weeds, and the Friendly Trail being turned into something that looked like a railroad right of way.

This time the women of Tidewater Virginia banded solidly together and asked the State Conservation Commission to halt proceedings until the facts could be brought to light. And they spread the news of the plight of the Desert far and wide. Now came help from all over the country. Arthur Newton Pack, president of the American Nature Association, entered a strong plea with the Conservation Commission that the intrinsic value of the Desert be preserved. Robert Cushman Murphy, president of the National Association of Audubon Societies, wired a protest, terming "the so-called improvement of the Desert" a "destructive trend toward the commonplace".

Protests also came from officers of the National and the Virginia Wildlife Federations, from the Director of the Gray Herbarium at Harvard, and from the Virginia Society of Ornithology. Dean Ivey Lewis of the University of Virginia and Dr. Edgar T. Wherry of the University of Pennsylvania added their voices.

Telegrams poured in from other sources, including the Virginia Academy of Science, the Emergency Conservation Committee, the Wild Flower Preservation Society and the American Nature Study Society. The conservation-minded press—Norfolk *Virginian-Pilot, Ledger Dispatch,* Richmond *Times Dispatch, Virginia Beach News,*—all swung their editorial influence to the aid of the Desert.

On the ground, the Garden Club of Norfolk was in command, and formed a general staff of members of women's organizations of Tidewater Virginia. Resolutions of protest and willing workers arrived from the women's clubs, from the Norfolk Association of University Women, the Junior League, the Society of Arts, and other representative organizations. The women were mobilizing to stop the ravishing of Desert, and stop it they did, as thoroughly aroused citizens usually are able to do.

A change in the conservation administration of Virginia came at this time, with the appointment of a new Conservation Commission chairman and a new State Parks Director. The newly-constituted commission held a hearing on the matter in April, inviting the women to appear and present their case. The case was presented and it fell upon sympathetic ears. The Conservation Commission, with the evidence presented by the committee of women and the counsel of the many protesting organizations, handed down a verdict for the Desert and for the devoted women of Tidewater and their Nature preservation allies throughout the country.

The cutting, raking, and denaturing was stopped. The Friendly Trail was to be restored as far as possible. The last vestiges of American wilderness areas retreating toward extinction are, at Cape Henry at least, reprieved.

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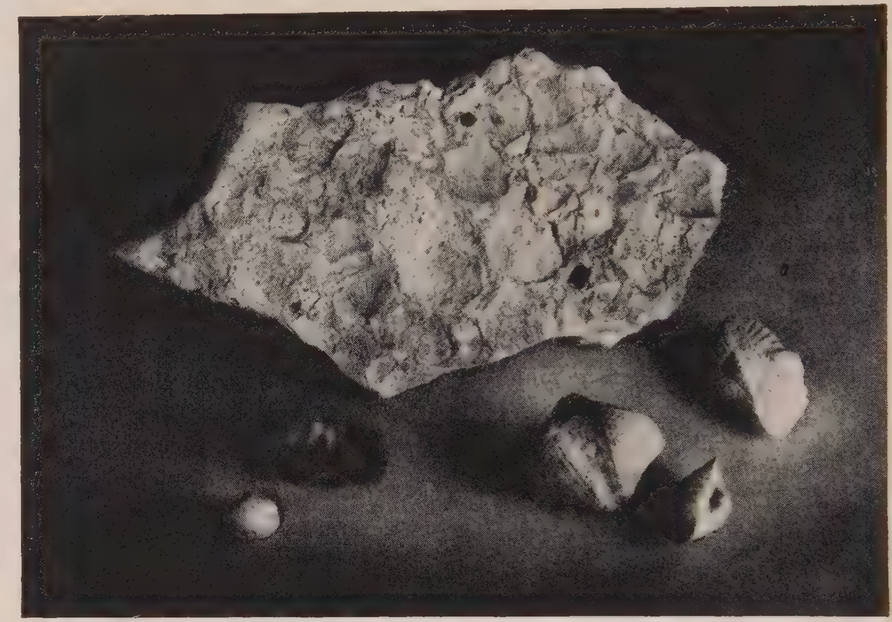
LAMP SHELLS

By C. S. GWYNNE

COLLECTING recent shells is fascinating, and, with some, a life-long hobby. Collecting fossil shells is even more fascinating to some people.

The fossil shells illustrated here were the protective coverings of animals that lived in the sea many, many years ago. Each specimen is really a pair of shells. If you look closely at the two specimens at the lower right you will see the hinge along which the shells could be opened and closed.



PHOTOGRAPH BY MARGARET BONINE FOX

INDIVIDUAL LAMP SHELLS AND IMPRINTS IN ROCK

The single shell turned up like a saucer is one side of a brachiopod, so shown to illustrate the reason for the name, lamp shell

These shells are sometimes called lamp shells because the saucer-like shape of a single shell resembles a Roman lamp, a shallow dish holding oil, in which a wick was laid. They are also called butterflies or butterfly shells because, when the shells are opened, they look much like butterflies with wings spread. Brachiopod is the name applied by scientists to the animal and its shell covering.

The word brachiopod is derived from the Latin word meaning arm and the Greek word meaning foot. This term is used because the animal moved along by means of an arm-like extension that served as a foot. This method of progression, however, is shared by other classes of molluscs.

The shells pictured here vary in appearance, but the animals that lived in them were of the same class. Like clams and oysters they had two shells, which covered the animal in the same manner. In the brachiopods the two shells are not identical in shape, yet each shell is bilaterally symmetrical. This means that if you carefully divide either shell along a line drawn from the "beak" at the center of the hinge to the outer edge of the shell, the two halves are alike.

Like clams and oysters, the brachiopods lived in the sea, and some of them are living there today. Their shells were preserved in the mud and ooze as the land emerged from the sea. When the mud was turned to stone by the deposition of mineral matter, one of three things happened: the shells were preserved in the stone; the imprint of the shells was preserved; or else the shell was replaced by mineral substances.

Sometimes the space between the two shells became filled with mud, and the shell was later dissolved out by water soaking through the rock. This left a cast of the interior of the shell.

The seas in which these animals lived have, of course, long since disappeared, and now the rocks formed from the sediments are subject to weathering and erosion. Thus fossils are loosened from the surrounding softened material. Then they may lie on the surface, or they may be easily freed from the surrounding rock.

The shells of other types of sea life may also be found preserved in fossil form, but lamp shells are abundant and well known. They are of particular interest because of the variety in their shape, size, and markings. They may be found in most limestone quarries; in many natural exposures of limestone and shale; along streams, or in roadcuts. Almost every state has some rock that contains fossil lamp shells.

NEW VARIETIES OF TULIPS ON DISPLAY IN "GARDENS ON PARADE" AT THE NEW YORK WORLD'S FAIR

LEAGUE OF NATIONS BUILDING PROVIDES A BACKGROUND FOR EXAMPLES OF TULIP PROGRESS

TIPS ON TULIPS

By ADOLPH KRUHM

THEY were there—a million strong—their flashing colors unfurled, heads high, a guard of honor of the greatest tulip show America has ever witnessed! Seven months before, wise bulb growers from Holland—the land of the bulbs' origin—had supervised their planting and forecast tulip time at the New York World's Fair. The tulips redeemed their promises.

In all the floral kingdom there are none more dependable than tulips. Planted in the fall, as they should be, they rarely disappoint. They offer us hundreds of varieties in a dozen different classes. They give us, also, a wide variety in size, shape and color of flowers, and in length of stem and blooming season.

The first to bloom are the so-called Single Early tulips, of which Pink Beauty—white with pink edge—is still one of the showiest and most popular. Another old-timer, now practically forgotten, was La Remarkable, a reddish wine-red tulip with a rosy-white edge. Then there are early and late double kinds; among the latter some that closely resemble peonies in size and form. The best-known and most widely-grown tulips we find in the May-flowering classes, under the family names of Breeder, Cottage and Darwin.

Of course each group presents new debutantes from time to time. Fortunately these do not make their bows as rapidly or as numerously as do the annual seed novelties that keep the gardener in a whirl! The introduction of a score of marigold novelties during the last five years is a case in point.

With bulbs, Nature herself puts on the brakes. Whether seedlings or vegetative mutations, all tulips are subject to similar processes of multiplication. Let's consider seedlings. It takes from four to five years to produce a mature flowering bulb from seeds. Out of the hundreds of seedlings a hybridizer grows, one may hold promise. That is the one the grower starts to multiply.

Depending on the character of the new variety, the mature bulb may split three or more ways. Taking three for an average, the original mother bulb will have produced six, or more, the second year. These, during the years to follow, will double the crop each year. By the end of a decade the originator of a tulip novelty may have as many as fifteen hundred saleable bulbs. This is not enough to export, but enough to know whether he has a prize novelty or a mediocre one.

While this process of multiplication is going on, the variety goes through the customary five-year trial period.

The newcomer's behavior must be as good or better than that of existing varieties. Flowers will be exhibited; judges invited. The reception it gets from the bulb world's most critical audience governs the value put on the novelty.

But it is not the original valuation of a tulip novelty that counts. A fair price should be maintained over a period of years to reward the originator for his years of waiting. If a novelty can take sunny or wet weather equally well; if it stands up well under varying soil conditions and has lasting qualities; if, finally, it does well under differing climatic conditions of different countries, then we have a truly worth-while novelty.

Such a variety is the Parrot tulip, Fantasy, that remarkable sport of the salmon pink Darwin tulip, Clara Butt. It first received the highly prized Award of Merit in Haarlem, Holland, back in 1919. The first bulbs, offered wholesale, were snapped up by other growers at one dollar each. In 1930 Fantasy still brought eighty dollars per hundred. This kind of novelty occurs rarely, and in this case it was a true bud sport of Nature, in the making of which man had no hand.

"In Gardens on Parade" at the New York World's Fair visitors found three hundred distinct varieties; nine different classes. The collection included many novelties not yet generally offered. The assortment afforded an opportunity to study what growers are striving for in the way of novelties. And the number of varieties showing radical departures from accepted standards was really not great.

Among the Breeders, the tendency is still in the direction of the bronze-violet-purple, with the usual contrasty margins on the petals. The number of Breeders on the market today runs into hundreds. But among them are a few that are truly outstanding and will be the standard-bearers of their class for years to come. The following ten are not expensive novelties, but leaders nevertheless: Admiral Tromp—orange, flushed salmon; Garibaldi—lilac bronze, primrose edge; Cherbourg—golden-yellow, shaded apricot; Indian Chief—reddish mahogany, flushed purple; Bacchus—immense dark plum-violet; Thomas Stevenson—soft lavender, feathered red; Louis XIV—dark purple-edged golden-brown; Orange Delight—describes itself; Velvet King—glossy maroon-purple; James Watt—black-purple, edged dark brown.

WELL-NAMED A TRIUMPH TULIP

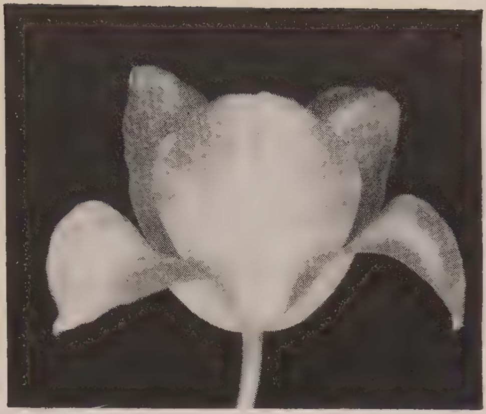
This is Denbola, one of about a score of this class that is, in fact, a true floral triumph

Cottage varieties feature the more delicate shades of pink, yellow, rose, lilac, orange and many intermediate nuances. In a small percentage we find contrasty combinations, and colors that change as the flowers age. The majority have gracefully curved petals, and this characteristic of the Cottage tulips comes to a climax in a small group now offered separately as lily-flowering tulips.

Among Cottage tulips the following medium-priced varieties of recent introduction will fill the bill to perfection in the average home garden: Carrara—a pure white with yellow stamens; Pink Delight—a pink picotee edge gradually suffuses whole flower; Dido—rich pink with salmon and orange shades; Marjorie Bowen—buff salmon, shaded deep rose; Mayflower—deep rose with purple sheen; Scarlet Glory—brightest scarlet; Nectar—a long-lasting carmine red; Refulgens—enormous warm orange; Arethusa—pale primrose, edged lemon-yellow; Jeanne Desor—deep orange-yellow, edged scarlet.

Darwin tulips have always been noted for their strong self-colors. But if the "Gardens on Parade" collection of this class can be considered an indication of what growers are striving for, the tendencies in Darwins are now toward lighter, softer shades. A particularly interesting phase was encountered in the presence of ten pure-white varieties of varying shape, size and texture. This has been a development of the past decade.

Fifteen years ago there were no white Darwins, a white Cottage being sold as "the" white Darwin. But fashions



LEFT, CHERBOURG, A BREEDER TULIP; ABOVE, MARJORIE BOWEN, A COTTAGE TULIP; RIGHT, DRESDEN CHINA, A DARWIN TULIP

in flowers are dictated by a fickle public. The Hollanders quickly noticed increased and insistent demands for a white Darwin of greater substance and on longer, stronger stems than can be found on a Cottage tulip.

There were more than one hundred different choice Darwins in "Gardens on Parade", and even experts would greatly differ in their choice of a best ten. But I am taking a chance with the following on the basis of personal experience with these varieties: Eclipse—finest of all dark-red Darwins to date; Dresden China—soft lilac-rose of clear color; Princess Mary—carmine-rose, blush margin; Caroline Testout—glistening pink without flaw; Niphetos—long-lasting lemon-yellow; Glacier—grandest pure-white perfected so far; The Bishop—a gorgeous violet-purple; Faust—choicest of all deep satiny purples; Insurpassable—clear lilac; Maya—clear lavender, silver base.

DRESSED FOR THE OCCASION

A Dutch costume goes with admiring this fine display of cottage tulips

Many of the varieties "on parade" are presented through some catalogs as "ideal" Darwin tulips. A distinction is being drawn between the run of Breeders and "Giant" Breeders. Some kinds that should be left in the Cottage class are introduced as new hybrids, Chinese Lantern, Chameleon and what-not tulips. It is quite bewildering, even to the seasoned gardener. Perhaps the lists are getting too long, causing subdivisions to be more desirable.

But there were two classes that did hold genuine surprises. These I commend to the special attention of readers in search of the new and different. I am referring to the multi-flowered tulips, and to the Triumphs.

Believe it or not, every Dutch bulb grower through the centuries has condemned tulips that would bear more than one flower to the stem. Old "Baron de la Tonnaye", now offered by few, used to yield up to 250 flowers from a hundred bulbs—and the men who sold them didn't like to have me tell about it. That was the old-fashioned view.

It is different now. Bunch-flowering or multi-flowering tulips are now coming into their own. Why shouldn't they, when a variety like Monsieur Mottet, for instance, produced four to five lovely, creamy white flowers on one stem; all open at one time; a whole bouquet in itself!

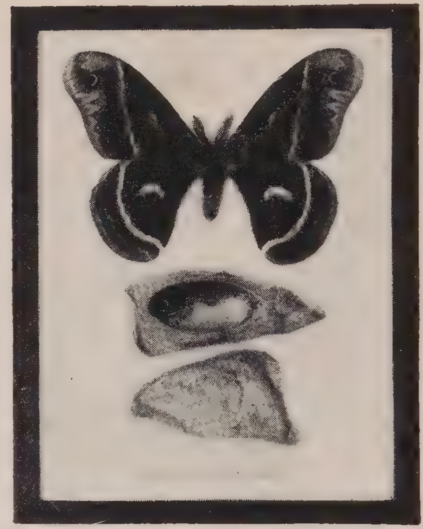
There were a dozen varieties of these bunch-flowering tulips in "Gardens on Parade" at the World's Fair. Comparatively few visitors took notice of purple-garnet Dragoon, having as many as six flowers on one stem. Defender had, perhaps, the largest flowers of the lot—four to a stem—but unfortunately of a color admired by few, a bright magenta leaning toward purple. Rainbow is a well-named variety. The flowers were pink on Monday, changed gradually to rose by the middle of the week, becoming a real cerise before they finally passed out.

And now for the "piece de resistance" of this tulip story—the Triumphs! It is all of fifteen years since a Dutch grower came to me and said, "I want you to write an introduction for me for the greatest tulip find in generations." "All right," I said, "what is it?" "It's a new class," he said, "something entirely different, something so unique that it'll revolutionize the growing of tulips." And with this remark he handed me a list of more than thirty Triumph tulips, all of which had been developed quietly in Holland. I told him it could not be done. American gardeners, I warned, would not swallow novelties in chunks as big as that. He took my word and offered a few. Today there are available about a score of these Triumphs—correctly called so, for they stand for a triumph of the fine art of hybridizing.

Early here I referred to two old-time single tulips—Pink Beauty and La Remarkable. These two have been acknowledged as two of the parents of these remarkable floral triumphs. Their pollen (Continued on page 471)

The ESCAPE of SAMMY CECROPIA

By GEORGE A. SMITH



SAMIA CECROPIA, AND ITS COCOON

Above, the corner of a demonstration table in a biology classroom, where the moth spun its cocoon, and the process of moistening

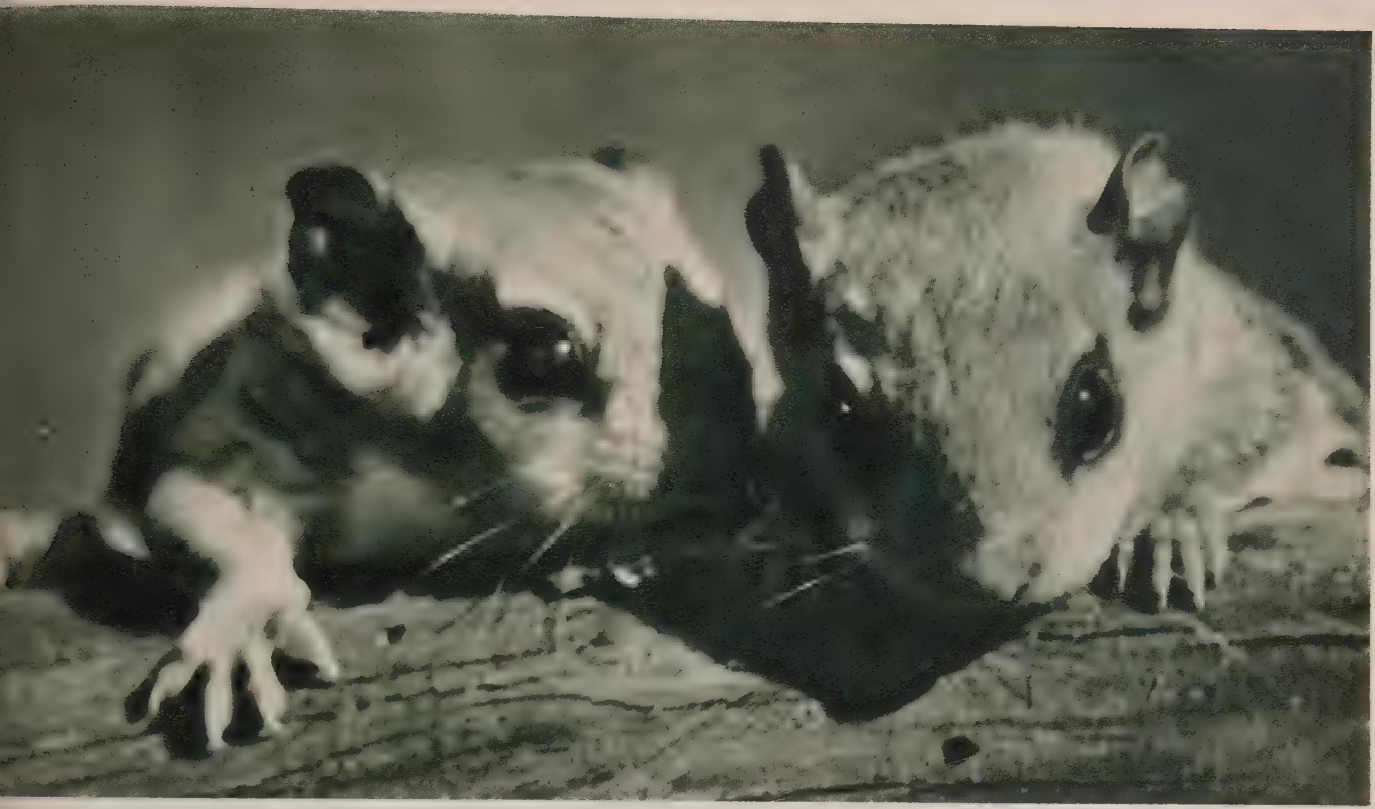
A FAT Cecropia caterpillar was brought into the biology class of the high school at Quarryville, Pennsylvania. After the class had studied at close range this bluish-green dragon-like animal armed with rows of horny projections, it was placed in a glass jar in the hope that it would spin a cocoon. Maple leaves were supplied and the jar was set out in full view on the demonstration table.

Several days later the class was mystified to find that the caterpillar had escaped by pushing off the cover glass. A search was begun in the out-of-the-way places of the room, and soon a shout from one student announced a beautiful brown, silken cocoon under the corner of the demonstration table itself. In a natural habitat the Cecropia caterpillar generally places its cocoon on the under side of some branch or twig, thus insuring some protection to the pupa, and upon emergence a convenient location from which it may hang with its back down while pumping the strength-giving life fluid into its immature wings. Apparently the under side of the corner of the demonstration table was the nearest to an ideal spot that our guest could find in a biology classroom enclosed within four tight walls.

Careful examination revealed an opening or valve in the end of the cocoon through which the moth would emerge after its rest period in the pupal stage. This valve also served as an opening through which water could be poured occasionally to keep the pupa case from becoming too dry in the warm room. Check of the humidity of the biology room showed that it was almost as dry as a desert, and in no way suitable for a cocoon that, under natural conditions, would be moistened with rain and snow. A watering device was made by connecting a short piece of glass tubing to a small glass funnel. To pour water into the cocoon, it was necessary carefully to insert the end of the glass tubing in the opening, and then to raise the level of the water so that it would flow in by gravity.

The next episode of this unusual biology class experience occurred one morning, several months later, when a big brownish-gray moth with gorgeous spots and bands of red and white on each wing was discovered on the ledge of the display cabinet. Although it had been hoped that the moth would emerge while the class was in session, this extraordinary experience unfortunately did not fall to its lot. In order that the moth might be preserved for future study, it was quickly and painlessly consigned to a cyanide jar. The specimen was then carefully pinned out and dried before it was permanently mounted. It was also decided to mount the empty cocoon case along with the moth. The cocoon was carefully removed from the corner of the table, and cut through the middle with a razor blade so that when mounted one half would show the outside and the other the inside of the silken case. To make sure that all insect pests were killed in the cocoon before it was mounted, the two halves were sealed in the cyanide jar for several days. Then, as an extra protection against insects that might enter and ravage the specimens, a small quantity of paradichlorobenzene was placed in the mounting case. Many beautiful moth and butterfly specimens are soon destroyed because they are not properly disinfected and protected. The prepared moth and the two halves of its cocoon were then carefully placed, along with an identifying label, in the mounting case, and finally displayed in a prominent section of the display cabinet.

Although "Sammy Cecropia", the name by which the class referred to *Samia cecropia,* under ordinary circumstances would have completed his life cycle in a more natural environment, the incident of his capture by a curious school boy, and his subsequent escape from a glass jar, gave rise to a sequence of unusual events that told one of Nature's marvelous stories to a biology class.



Woolly entertains company. A friend came to visit and brought along his own pet flying squirrel. Woolly—on the left—was quite curious about this visitor and spent several minutes cautiously sniffing. Finally, however, he decided that the newcomer would make a good playmate and the games were on.

The Story of Woolly, A Flying Squirrel

As told in pictures and words by Karl H. Maslowski

Woolly became my friend and companion quite by accident. One day I was out on a bird study ramble in a beech forest not far from Cincinnati. At one spot a stick barred my path and I reached forward to break it off. As my hand stretched forward a baby flying squirrel seemed fairly to be growing on the stick. He was breathing heavily and seemed quite tiny and terribly frightened. He clung desperately to the branch, appearing to be trying to regain the breath evidently lost in a tumble to the limb I had chanced to grasp.

Whence Woolly came, and how, I shall never know. Perhaps he had been engaged in a rough and tumble with his brothers and sisters and had been pushed from the nest high up in a den hole in one of the nearby beeches. Perhaps he tried some stunt far beyond his youthful powers or experience. In any event, there he was, and there seemed no way of discovering his family residence and restoring him to it.

So, although Woolly had no choice in the matter, he and I continued on the bird ramble. Then we turned our steps homeward, he to begin two years of life in a world peopled by large, two-legged mammals, and I to enter upon an experience of happy friendship with a son of the wild. Within twenty-four hours Woolly—for he was certainly a woolly little fellow—had accepted me and what fate seemed to have held in store for him.

Food, of course, was an immediate problem, and Woolly went on a diet of diluted milk from the end of a medicine dropper. Only a few minutes were necessary to learn the trick. He liked this means of getting his food, and all his life he was ready for a dropper full of milk, orange juice, prune juice, cider, pop or even beer.

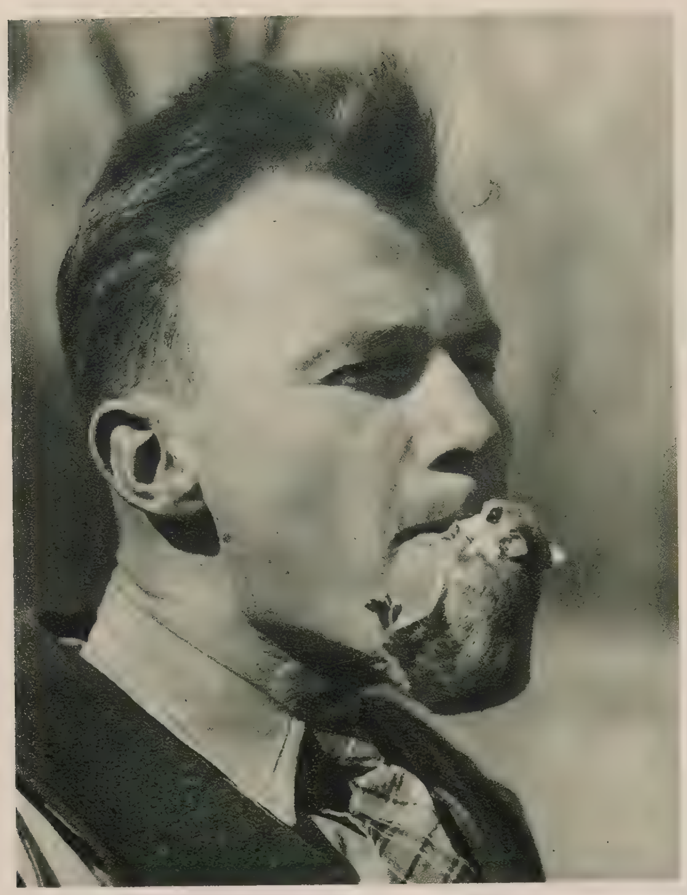
Woolly's favorite lodging place during most of the day was the lower right-hand vest pocket. Like other members of his clan he became most active after twilight. If, however, one wished to lure him from his hideout at any time, a peanut was always sufficient as a reward for his appearance.

It is hard for one who is not familiar with habits of flying squirrels in the wild to realize the extent of the change that confronts a little creature like this, suddenly snatched from its natural home, and from the care of its mother, and brought into man's home. The little squirrel has known no daylight, for all of its short life has been spent in the recesses of a snugly-woven nest, or the depths of a hollow tree. Its only food has been its mother's milk, or perhaps, the soft kernels of immature nuts or the opening buds of leafing and fruiting trees. All at once, he is transplanted into a world of man-made structures and strange surroundings, hearing only a new and unintelligible language, presented with unaccustomed food, blinded with the glare of daylight or electricity, and without the companionship of any furry comrade, even of a different race. Yet so strong is the trust in all Nature possessed by young animals that the little squirrel, its hunger once satisfied, accepts the new regime, with all its contrasts, and clings to the new friends it has found. The case of the flying squirrel well illustrates the feeling of kinship and trust with which wild creatures honor us when they are treated with kindness. They accept us as a part of Nature, and, with few exceptions, continue to trust us as long as they are well treated.

Flying squirrels should really be called gliding squirrels, since the folds of skin that extend along the sides between the fore and hind limbs do not admit of flight as in birds and many insects. However, as an aid to gliding, these wings are highly efficient. After running up a tree to gain height the little animal can glide many yards.

•

Woolly was always ready for a trip and, as he grew older, became a constant travelling companion. He particularly enjoyed picnics or camping trips, and always made it a point to sample whatever was being prepared for the meal. Here we see him putting his stamp of approval on the contents of a spoon used to stir a pot full of apple sauce. Wrinkling his nose, he indicates that it smells fine. Just to sustain his judgement he samples it and decides that it tastes good, too.

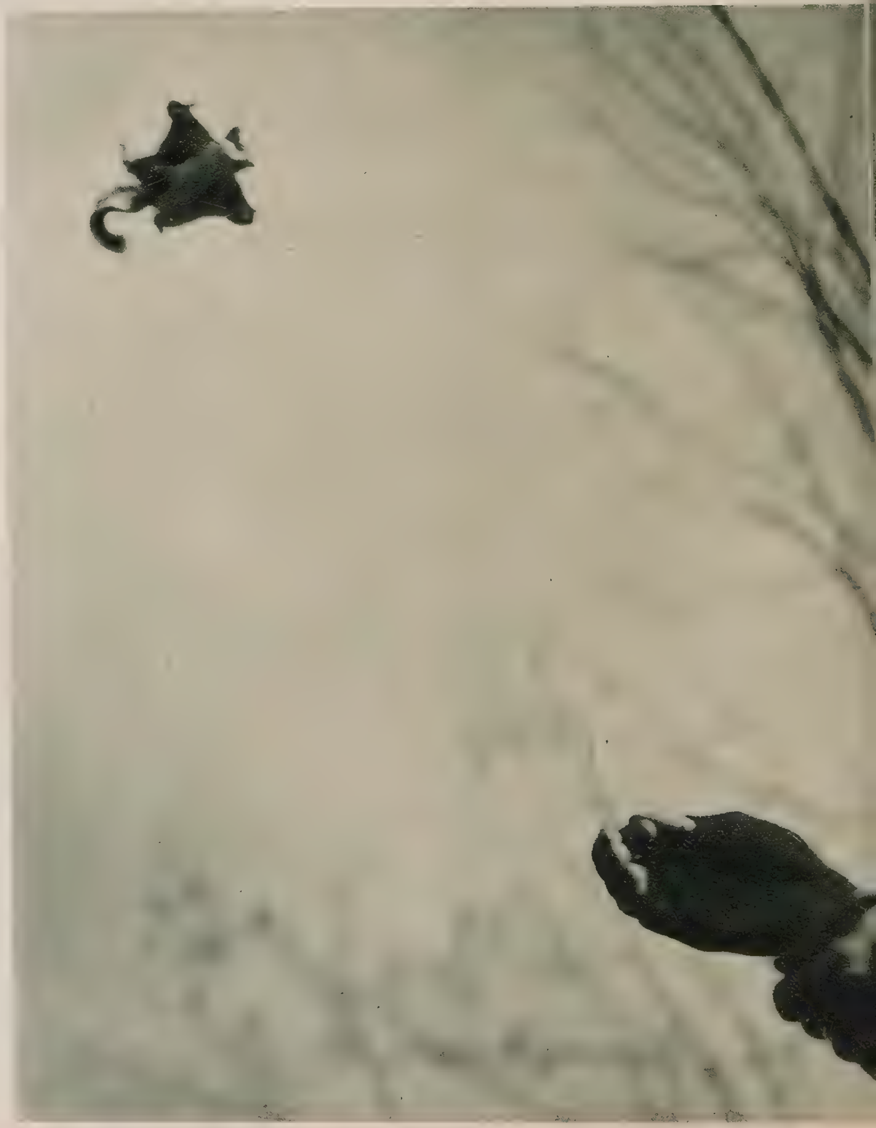


Woolly would go to any lengths for a peanut. He had acrobatic ability equal to taking one from my mouth, the meanwhile tickling my Adam's apple when he tucked his soft tail under my chin. This procedure nearly dislodged the peanut anyway.

Once obtained, the peanut would be carried to my shoulder and quickly hulled. Woolly was always careful to see that most of the shells were stuffed down inside my collar.

Woolly's best trick was to jump for food held in my hand. He would come sailing down like a magic carpet.

For two years Woolly lived with me, his spirit finally being ferried to that beechnut tree heaven where all good flying squirrels must surely go. During his lifetime he travelled more than 15,000 miles. He was probably the first flying squirrel to go through the Holland Tunnel, fly in a plane over Cincinnati, peer out from the top of the Washington Monument, visit the Wright Memorial at Kitty Hawk, and sail around Bonaventure Island.



Some Common Rocks and Minerals

The sixth in Nature Magazine's series of special educational inserts

By E. LAURENCE PALMER

No one would assume that an eight-page article could deal exhaustively with birds, insects or trees. It is hoped that no one would expect this article on rocks and minerals to be anything like a complete treatment of the subject. If it leads one to consult more exhaustive sources, or to make first-hand studies of the rocks and minerals available locally, it will have served.

While it is doubtful that anyone without some previous experience could, with the help of the material given here, identify accurately or appreciate thoroughly any great number of rocks, some activities may be suggested that will help one to learn directly about the properties of local rocks and minerals.

This page may merely help define some of the words used in the charts that follow. Almost anyone can distinguish the substances that are called mud, sand, gravel, humus, snow and lime. But what happens to these things if they are left to themselves? We know that they may be washed here and there by water; that they may be blown by the wind; that they help or interfere with the cultivation of lands. Mixing them, we can make the surface of the earth suitable for highways, for growing roses, or for pasturing cattle. Almost all that is done in agriculture involves such activities, and agriculture affects all peoples.

Consider also what happens to these things when buried under great masses of earth, exposed to high or low temperatures, subjected to twisting strains, or changed slowly or quickly in any way. Briefly, most of them may be compacted to points where, if a mass is lifted, adjacent parts will be lifted also. The individual grains with which we started may still be recognized, even though they may have been cemented together in one way or another. Such consolidated materials may be formed from sediments dropped in moving currents of air or water, thus making *sedimentary rocks.* This may loosely be compared to what happens when snow falls to form snowbanks.

If the consolidated materials are pressed further they may change their nature, and form *metamorphic* rocks. The chemical nature of these rocks may be the same as when they were sediments but they differ physically.

These metamorphic rocks may be buried still deeper or changed further by heat, or by other means, until they may become a molten mass. The rocks thus formed are *igneous.* If this mass is allowed to cool slowly, or the pressure is released slowly by the mass above wearing away through erosion or other means, the materials in the molten mass may variously crystallize. Rocks formed in this way are *intrusive,* while those that relatively more quickly make their way to the surface through cracks or are released through volcanic action are *extrusive.* Rocks of each of these types are discussed in the succeeding charts. These igneous rocks—and the others as well—when exposed to the action of weather break down irregularly. The softer parts naturally wear away first. Those parts that are easily dissolved in water will disappear more quickly than others, and sooner or later both soft and hard parts may be piled up again as sand or mud or gravel.

So far as the minerals are concerned each of these may be investigated by anyone to his own satisfaction. Some of the things to look for are suggested in the keys to the charts on minerals. Others might easily have been added. But all of the characteristics used in describing rocks are determined by what happens when they are struck, broken, bent, twisted, squeezed, frozen, illuminated by different kinds of light, heated, exposed to water or acids or to an electric current; how they behave when mixed with other minerals under varying conditions and with which they will mix; how much they weigh, and so on. Mineralogists have naturally established standards for measuring the qualities of the different minerals. For example *hardness* is compared with that of a diamond, which has a hardness of 10, and talc, which has a hardness of 1. The other minerals range between these figures. Similarly a scale of *fusibility* has been established to denote at what temperature the substance will melt. Instead of using degrees on a thermometer it is more common to say that a substance like sulphur, which melts at a point a little above that of boiling water, has a fusibility of 1, while quartz, which, even in the hottest part of a flame of a blowpipe, will not melt, has a fusibility of 7, or is ordinarily considered infusible. Homely ways for carrying on some simple experiments in this field are given on the School Page of this number.

This article is a modification of a similar one by the author published as one issue of the *Cornell Rural School Leaflet* by the New York State College of Agriculture at Cornell University. It is felt that reactions to material in that number of the *Leaflet* have permitted improvement in this presentation. Appreciation is expressed to the College for permission to revise this material and to use it to supplement the author's personal experiences with rocks and minerals. The illustrations are by the author and his wife, Dr. Katherine Van Winkle Palmer. Recommended are:

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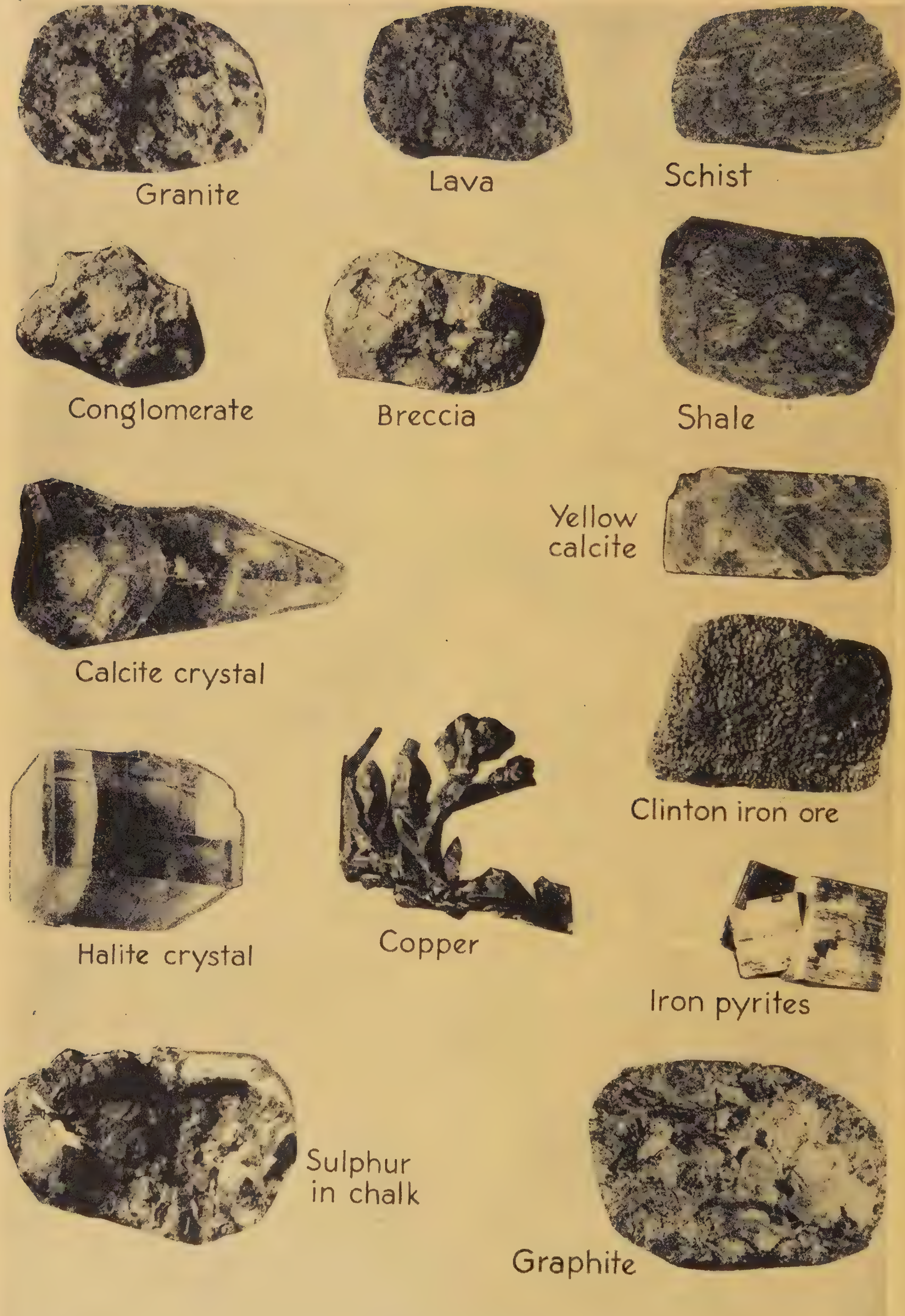

Granite
Lava
Schist
Conglomerate
Breccia
Shale
Yellow calcite
Calcite crystal
Clinton iron ore
Halite crystal
Copper
Iron pyrites
Sulphur in chalk
Graphite

PLATE 1.

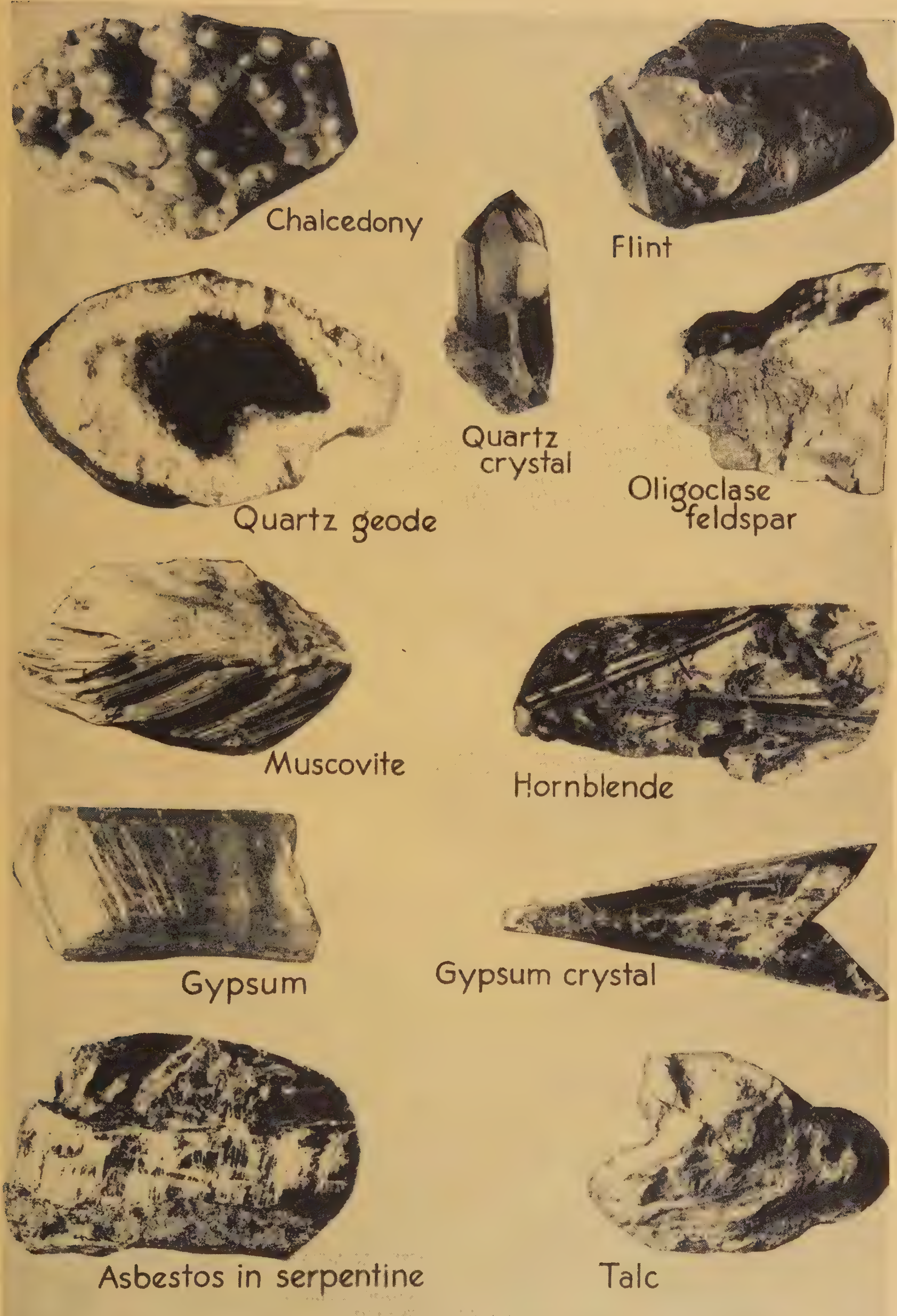
Chalcedony
Flint
Quartz crystal
Quartz geode
Oligoclase feldspar
Muscovite
Hornblende
Gypsum
Gypsum crystal
Asbestos in serpentine
Talc

PLATE 2.

UNCONSOLIDATED MATERIAL **Nature**	GRAVELS and TALUS. Composed of pieces of rock larger than peas. If water-worn and with rounded edges, it is gravel, but if made of angular pieces unworn, as at foot of cliffs, it is talus.	SAND. Much sand is quartz made from the disintegration of such quartz-bearing rocks as granite. Coral-beach sands may be of lime. Ordinarily of particles smaller than peas.	MUD. Loose, generally fine-grained earthy materials commonly formed of softer parts of rocks such as kaolin, feldspars, micas, and so on. When dry, loose dust or compacted clays. Insoluble.	LIME CARBONATE. Animals and plants in the sea convert soluble lime carbonate—$H_2Ca(CO_3)_2$—into the insoluble—$CaCO_3$—freeing carbon dioxide. Algae and foraminifera vital in this.
Where found and how formed	Commonly formed in watercourses where there is a swift current, or at base of tall cliffs and mountains. Gravels may be formed by wave action, which rolls and wears the materials.	Materials that are deposited from moving air or water before the silts, muds and clays. May make extensive dunes and deserts and border many waterways, as the Great Lakes.	In slowly-moving parts of waterways, over the depths of the oceans and as *loess* by wind over great stretches of land. May form loose floor on bottom of waterways dangerous or helpful to life.	Foraminifera may be the size of a grain of sand or much larger. Lime deposits may cover the sea floor or form marl in bodies of fresh water. Corals associated with some lime deposits.
Uses	Common as fillers in road-building. Used in concrete, and, since it does not hold water well, may be used for playgrounds, paths and the like. Suitable for limited kinds of plants.	Quartz sand may be biologically nearly sterile, but may hold valuable mixtures and provide superior water-holding qualities for some plants in some regions. Unstable, needs anchorage.	Properly mixed with air, chemicals and water, mud provides excellent growing medium for plants. Helps build up richest fertile areas on the earth and supplies major sources of farm wealth.	Chalk is slightly consolidated lime. Great beds of rock are built by lime-depositing creatures. Agassiz estimated coral could build up about 40 feet of deposit in 1000 years.
CONSOLIDATED SEDIMENTS **Nature**	CONGLOMERATES are consolidated gravels cemented together and showing water-worn character of component units. BRECCIA is made of consolidated rocks not water-worn.	SANDSTONE is chiefly quartz sand cemented with silica, iron oxide or clay, but, when broken, shows sand grains. May be porous so that 30 percent is space between the grains. May hold water.	SHALES are consolidated muds still in the layers in which they were laid down and frequently splitting along planes of varying degree of fineness of composing materials. Generally weather away.	LIMESTONES are compacted lime carbonate. They effervesce when treated with hydrochloric acid except that dolomitic limestone of calcium carbonate and magnesium does only with hot acid.
Where found and how formed	Conglomerates in which the cements and pebbles or bowlders are contrasted are called pudding-stones. Many conglomerates show by scratches their origin in glacial action.	Constitutes about 15 percent of the stratified rocks of the earth. Varies in strength due to differences in cement. ARKOSE is sandstone made of unaltered feldspar; origin, continental or marine.	Constitute about 80 percent of the stratified rocks that overlie the bed rocks of the earth. Some are of fine, hard quality, in uniform beds; others, loosely consolidated and of a heterogeneous nature.	Limestones constitute about 5 percent of the earth's stratified rocks. The lime may be mixed with sand, clay and other materials. Lime deposits are commoner in warmer seas.
Uses	May be cut and used as building stones, which are attractive if component parts vary greatly. Useful in interpreting the physical geography of the past where they are found.	Quarried or crushed and used in the building trades, although less so than in the past. Probably less used than limestone. May be crushed and used in road building.	Some are used in the making of cement; others, make flagstones. They both help and interfere with maintaining a water supply since their irregular nature affects the water table.	Valuable as source of lime for fertilizer and making mortar. Heated to just over 900°C, is so changed that, if water is added, the mixture may become as hard as the original limestone.
METAMORPHIC FORMS **Nature**	GNEISS (pronounced nice), formed of quartz, feldspar and mica, with mica usually in more or less definite plane giving a banded appearance in cross section. Little pore space.	QUARTZITE is metamorphosed sandstone so firmly cemented that fracture may take place through component sand grains rather than around them. Of quartz sand with silica cement.	SLATES are shales metamorphosed by pressure and heat into flat plates, which may not agree with the original stratification. The mineral grains are too fine to be seen with a lens.	MARBLE is metamorphic limestone changed by heat to a crystalline rock. Uniformly textured, does not tend to split. Marble takes a high polish; limestone does not.
Where found and how formed	There is a tendency for gneiss to split in one direction. The rocks are conglomerates changed by heat and tremendous pressure. Hornblende may replace the mica. Garnets may occur.	Found as rock or as very hard pebbles. If mashed in formation, may appear as a *quartz schist*, or, if impure because of presence of mud, a MICA SCHIST may be formed.	Found in older rocks such as the Cambrian and Ordovician, an important supply coming from Vermont, New York, Virginia and elsewhere. Rocks are quarried, split and sawed or ground.	Large quarries in Vermont, Massachusetts, Pennsylvania, and in many places in the West. In dolomitic marbles, calcium carbonate is largely replaced by magnesium carbonate.
Uses	Heavy hard rocks originating deeply. May be broken and used in heavy construction activities. SCHISTS are usually softer and weather less successfully.	Quartzites and schists may be too hard to be cut conveniently, but crushed quartzite is used in concrete work, in road building and in glass making.	Formerly used principally in natural planes as tables, roofing, flooring; now used also with asphalt filler and paint in making artificial tiling, shingles and the like.	Used in interior decoration and in monuments. Used in the latter way may deteriorate by weathering but will serve for a reasonable period.

ORGANIC MATERIAL, the remains of plants and animals, either their bodies or waste products, make loose *humus* in the soil and provide acids, salts and carbon compounds.	WATER. H_2O. Freezes at 0°C or 32°F; boils at 100°C or 212°F. Tasteless. Transparent. Almost universal solvent, so rarely pure in nature. As vapor forms clouds, fogs; collects as dew and rain.
These materials help in breaking down of rock compounds and themselves add to the chemical nature of the mixture. They may accumulate as in peat beds and bogs, or be dissipated.	In all living things. Covers 139,440,000 square miles of the earth's 196,950,000 square miles of surface, and rare only over the 5,000,000 square miles of desert; otherwise in soil.
Valuable as source of food for plants of many sorts, as fuel when dried, as mulches in gardens, as holders of soil moisture. Green manures renew the supply, which may be exhausted.	Essential to life in solution of foods, translocation of foods and wastes. Important in mingling parts of earth's surface and important aid to commerce for man. Provides beauty and recreation.
Consolidated organic remains may be in many forms as PEAT, BITUMINOUS COAL, or, if from bones, shells and waste products, may be GUANO, ROCK PHOSPHATES and the like.	SNOW BANKS. Formed by crystallization of water vapor into 6-pointed stars and settling by gravity through the atmosphere to form strata of snow in banks or great layers. White. Slippery.
Phosphate beds occur in Tennessee, the Carolinas, Florida, great area in western South America in Chile. Soft coal deposits extensive through the Great Basin and elsewhere.	Covers the polar caps of the earth and extends toward the equator in winter seasons and at great elevations. Can form protective blanket preventing rapid changes in temperature.
Essential use is as fertilizers, fuel and in certain types of manufacturing industries. Some highly valuable in making explosives, useful in agriculture and unfortunately in war.	Helps many winter plants and animals by insulating cloak. Provides continuous flow of water from high altitudes. Assists in some types of transportation. Provides beauty and recreation.
Metamorphosed carbons may appear as GRAPHITE, as DIAMONDS and as ANTHRACITE COAL. Of these, the diamond is the hardest and the graphite the softest.	ICE. Formed by freezing of liquid water. Increases in volume when freezing. May be caused by increased pressure within limits as in parts of glaciers. When pure is transparent. Brittle.
Diamonds usually associated with volcanic origin. Hard coal is formed by softer coals under pressure. Natural gas and petroleum also of organic origin.	Covers bodies of fresh water in colder parts of the earth. When expanding in freezing, breaks up many rocks and in glacier form grinds rocks. May cause death of plants and animals.
Uses well-known and varied. So valuable that individuals as well as whole nations do not hesitate to try to annihilate others who possess these forms of wealth.	Serves as reservoir for water. May kill fish by cutting off access to air and water birds by cutting off access to food. Provides unique transportation, sport, and helps preserve foods.

INTRUSIVE ROCKS **Light-colored** **Nature**	GRANITES, a combination of quartz, orthoclase feldspar and hornblende or augite; often with mica. Usually light in color. Usually individual minerals visible to naked eye.	SYENITE, with texture like granite; of orthoclase and either hornblende, augite or mica but always without quartz. It may include other feldspars than orthoclase. Light-colored.
How Formed	Igneous; cooled very slowly, probably under great pressure. Intrusive. Large grains set in collection of smaller grains form *granite porphyry*. Varieties named from dark minerals.	Formed like granite and cooled slowly under pressure, commonly under the folds of mountains. Less common than granite and does not occur in such large masses. Intrusive.
Use and where found	Common in Adirondacks, Lake Superior region, Black Hills, Rocky Mountains and Sierra Nevadas. Superior building stones. Basic for much soil formation.	Best localities in Arkansas, Colorado, the White Mountains, eastern Canada from Labrador to Ontario, Minnesota, Norway and elsewhere. Used as building stones.
INTRUSIVE ROCKS **Dark-colored** **Nature**	DIORITE without quartz but with plagioclase feldspar plus mica and/or hornblende. GABBRO with plagioclase feldspar and any pyroxene, commonly augite.	PERIDOTITE, blue or dark rocks composed of olivine and any of the pyroxenes; generally appear to be made of large crystals. No feldspar. May include garnet, chromite and others.
How Formed	Igneous; cooled slowly much like granite. Intrusive. May appear as a porphyry, or of the even granular type. Dense gabbro with small crystals is DIABASE-formed near surface.	Generally associated with and formed like gabbro, differing in the absence of feldspar. Usually found as dykes, sheets and small intrusions. Are intrusive. They are not common.
Use and where found	Associated with the other igneous rocks but particularly good in the White Mountains and in the Rockies. Used extensively as building stones. Both generally dark.	Important sources of platinum, chromium, nickel and diamonds. Generally dark and heavy because of iron in them. Diamonds of Africa and Arkansas from these rocks.
EXTRUSIVE ROCKS **Nature**	BASALT or traprock, a mixture of plagioclase feldspar, magnetic iron ore, olivine and a pyroxene. Crystals not seen. Dark. FELSITE, light and with more feldspar.	OBSIDIAN, clean, lustrous, hard glass which forms crusts on lava flows. If duller, the substance is PITCHSTONE; if frothy, PUMICE. Always hard; often has gas cavities. Extrusive.
How Formed	Formed by molten material being forced up into other rocks through cracks and fissures large or small.	Formed by the quick cooling of lava flows from volcanoes. Material which is expelled explosively may form volcanic ash, tuff and volcanic breccia.
Use and where found	One of commonest igneous rocks in New England, the Palisades of the Hudson, in Lake Superior region and the far west particularly northwest. Used for filling and ballast.	Found in Rockies, California, the Cascades, Sierra Nevadas, the Yellowstone. Primitive peoples used it for knives, ornaments and weapons. Pumice used for polishing.

NAME OF MINERAL	**CALCITE** **(Lime)** **$CaCO_3$**	**HALITE** **(Salt)** **NaCl**	**GALENA** **(Lead Ore)** **PbS**	**SULPHUR** **S**
COLOR, STREAK AND WEIGHT	White to colorless, or sometimes tinted with pink, yellow or blue, with a glassy or earthy luster. Streak, colorless. Effervesces freely with hydrochloric acid. Weight, 2.72 times that of water. Clear crystal of Iceland spar shows double refraction of light.	Colorless to white, translucent or transparent, vitreous, soluble in water and producing a colorless streak. Weight, from 2.1 to 2.2 times that of water. It, of course, tastes salty.	Lead-gray color, metallic, producing a lead-gray streak. Crystals, opaque, are inclined to glisten and sparkle because of their exposed faces. The metal is not easily penetrated by radium. Galena is 7.5 times as heavy as is water. Poor conductor of electricity.	Characteristic sulphur-yellow or even gray to brown or reddish. Masses, opaque, but crystals sometimes translucent. Resinous for most part. Streaks, pale yellow or white. 2.05 to 2.09 times as heavy as water. Good insulator of electricity. When rubbed, becomes negatively charged. Nonmetallic native element.
HARDNESS, FRACTURE AND CRYSTALLIZATION	Hardness, 3, may be scratched with a penny. Conchoidal fracture seldom seen because of ease of cleavage which is perfect in three directions oblique to each other and at about 105°. Structure, granular, earthy, stalactitic or crystalline. Crystallization, hexagonal, rhombohedral, prismatic; may twin and be of great beauty.	Hardness, 2.5, may be scratched with a fingernail. Cleavage, perfect cubes. Crystals, nearly always cubes but sometimes hopper-shaped or with faces concaved by four-sided pyramids. Halite is often granular, massive to compact, depending upon method of crystallization.	Hardness, 2.5, and can be scratched by a cent. It breaks in three directions parallel to the cube faces showing isometric cubes or crystals. Highly malleable, ductile. The ore is cleavable, coarse or fine grained, massive. When fine grained, it may seem to be compact. Occasionally octahedral crystals are formed.	Hardness, 1.5 to 2.5, may be scratched with the fingernail. Very brittle though masses may sometimes be cut. Some forms plastic. Has an uneven or conchoidal fracture and no distinct cleavage. Occurs in orthorhombic crystals often in double pyramids or is earthy, stalactitic, fibrous, reniform, massive.
GENERAL RECOGNITION CHARACTER AND HEAT EFFECTS	Occurs as veins; in caves, as stalactites; as deposits in springs, in shells of animals; as cementing material in sandstones; cementing shells together to make coquina; as limestone; chalk or marble associated with igneous, sedimentary or metamorphic rocks.	Solubility in water and the taste usually suffice for quick identification. 100 grams of water at 100° C. will dissolve 39.8 grams of salt.	Melts in a candle flame as globules of metallic lead on galena. Melts at 327° C; boils at 1525° C. The outstanding characters are the weight, softness and usual cubic cleavage which may make it seem to be brittle.	Melts at just above boiling point of water, or from 112.8° to 119.3° C. Very poor conductor of heat and will crackle when warmed due to differences in rate of expansion.
WHERE AND IN WHAT FORMATIONS FOUND	Most limestones are accumulated animal shell remains or deposits of lime from water. These layers are built up, forming great beds which may be raised to mountain ranges. Subjected to pressure and heat they may turn to marble. Loosely compacted, they may make true chalk (not school chalk which is gypsum).	Makes up about 2.5 percent of seawater, more in some lakes, and found as rock salt where ancient seas have dried up. Germany, Austria, New York, Michigan are leading producers of salt. It is associated with gypsum and in the Southern and Western states the presence of salt is used as an index to the possible presence of petroleum.	Found in veins and irregular masses in igneous and in metamorphic and commonly in masses in sedimentary rocks. Associated with sphalerite, chalcopyrite, pyrite, calcite and argenite. Possibly most widely distributed of metallic sulphides. Important mines in Missouri, Utah, Colorado, Idaho, Iowa, Kansas and Oklahoma. 1937, U. S. production about ½ that of 1924 but thrice that of 1931.	Found in beds commonly associated with live or extinct volcanoes, in gypsum beds or salt beds, also combined with metals as sulphides such as galena, pyrite and chalcopyrite, and as sulphates when united with metallic oxides as in gypsum, barite and others. Sulphur is widely distributed in the world but Texas and Louisiana beds are the most successful commercially.
USE AND COMMERCIAL ABUNDANCE	One of the most important minerals to life, building bones and shells. Fresh-water sponges are not found in limy waters but snails and other molluscs are. Portland cement is made of lime, shale and gypsum, and in 1937 was 171 million dollar United States industry. Lime alone was a 30 million dollar industry. Its value in limestone and as fertilizer and in other products is not easily obtainable.	Essential to the life of most animals. Used in cooking and preserving food, in manufacture of glass, soda ash and soap, in bleaching and in industry, also used in refrigeration, to some extent in the care of roads, in oil refining, and as the chief source of sodium compounds used by the chemical industries. United States produces about ⅓ of the world's salt, annually about 8 million tons.	Extracted by roasting the ore, frequently as a by-product in the extraction of silver, with which it is commonly associated. United States production in 1937 about twice that of second-place Australia. Used in making pipes, paints, bullets, poison compounds, in solder and type-metal, for linings for tanks, and in electrical equipment, as in dry cells, and in many other ways.	Extracted by forcing steam into beds, melting the sulphur which is forced out and then cools and hardens. United States leads in production followed by Italy and Japan. Texas beds average 125 feet thick. Used in chemicals as insecticides, in medicine and fertilizers, in vulcanizing rubber, in gunpowder, matches and in making sulphuric acid for industrial uses.

COPPER and COPPER ORE **(Chalcopyrite)** **Cu and Cu FeS_4**	**IRON ORES** **(1) Pyrites FeS_2** **(2) Hematite Fe_2O_3** **(3) Magnetite Fe_3O_4** **(4) Limonite $Fe_4O_3(OH)_6$**	**QUARTZ** **SiO_2**	**MICAS** **(1) Muscovite** **$H_2K\ Al_3(SiO_4)_3$** **(2) Biotite** **$(HK)_2Al_2(SiO_4)_3$**	**KAOLINITE** **China Clay** **$H_4Al_2Si_2O_9$**
Copper, red to black and tarnishes; ore, brassy yellow. Both metallic. Copper streaks shining copper red; ore streaks black. Copper, 8.9 times as heavy as water; ore, 4.2 to 4.3 or about 5 times as light as gold. Copper, 2nd to silver as a conductor of electricity.	Color, (1) brass yellow; (2) red-brown to black; (3) black; (4) dark brown to black. Luster, metallic, in (1) splendent; in (4) dull. Streak, (1) green to brown black; (2) Indian red; (3) black; (4) yellow brown. Weight, (1) 4.95 to 5; (2) 4.8 to 5.3; (3) 5.18; (4) 3.6 to 4 that of water. Metal very ductile, malleable.	White, yellow, pink, blue, smoky, black, green, red, brown or transparent with a glassy, splendent to dull luster. May appear to be greasy. Crystalline and massive varieties. Insoluble. Streak, white, colorless. Weight, 2.6 to 2.7 times that of water.	(1) Yellow to white, pearly, vitreous. Weight, 2.76 to 3. (2) Brown to black, splendent. Weight, 2.95 to 3.2 that of water. Both are elastic, and if thin sheets are hit with a dull instrument 6-rayed star "percussion figures" are formed. Some, transparent.	White to grayish blue or yellowish, dull. Insoluble and about 2.6 times as heavy as water. Heat resistant. Opaque. Streak, colorless.
Hardness, copper, 2.5; ore, 3.5 can be scratched with a knife. Copper, highly ductile and malleable; the ore, brittle. Copper, rough or jagged fracture; ore, uneven. Copper occurs in irregular grains, sheets, isometric cubes or octahedral crystals; ore, in metallic veins, tetragonal or sphenoidal crystals.	Hardness, (1) 6 to 6.5; (2) 5.5 to 6.5; (3) 6; (4) 5 to 5.5. Fracture, uneven in (1) and (3), uneven or fibrous in (2) splintery in (4). Crystallization, (1) isometric cubes with striated faces or granular; (2) earthy, mica-like or in hexagonal rhombohedral crystals; (3) granular or massive, isometric, octarhombohedral crystals; (4) earthy, fibrous or otherwise, noncrystalline.	Hardness, 7, not scratched with glass. Fracture, conchoidal to uneven. Brittle. Cleavage, rare. Crystals, hexagonal and other types. Crystalline varieties: colorless; smoky amethyst; milky quartz. Massive varieties: waxy, translucent chalcedony; variegated chalcedony or agate; banded or onyx agate; opaque or semitranslucent, tough, usually gray flint; splintery chert; opaque, colored jasper.	Hardness, (1) 2.25; (2) 2.5 to 3 both easily scratched with fingernail. Both split into sheets as thin as 1/500 of an inch. Crystals are rare, monoclinic in six-sided plates sometimes some feet across. The lithia mica *lepidolite* lacks distinct cleavage but occurs in small scales. Phlogopite may show star when light is transmitted. It is usually amber.	Hardness, 2, may be scratched with fingernail. In compact, claylike masses or friable. By weathering or changing of feldspar, the potassium of feldspar unites with carbon dioxide to make water-soluble potassium carbonate. The water, part of the silica and aluminum make kaolinite. Generally not in crystals.
Excellent conductor of heat. Melts at 1083°C; boils at 2310°C. Almost all of the copper minerals are brightly colored. This and hardness help in identification. Chalcopyrite is softer than steel and might be confused with gold but for weight.	(1) Easily fusible to magnetic globule; (4) fusible with difficulty; (2) and (3) infusible. (1) Soluble in hydrochloric acid; (2) and (3) slowly soluble. Good conductor of heat and of electricity. (3) Strongly magnetic. Metal melts at 1530°C.; boils at 2450°C.	Fusible with great difficulty. The massive quartzes do not break to show the crystalline form, some like pseudomorphous quartz replace organic material as in petrified wood, others may have been formed by cooling quickly.	(1) Thin splinters melt with blow pipe; (2) melts with difficulty. Lepidolite may be melted on a coal stove. The softness, sheet cleavage, luster and elasticity are sufficient for ordinary identification.	Identified by friable nature, the fact that when dry it sticks to a wet tongue and gives off a characteristic clay odor when breathed upon. Is always dull but when burned may change in appearance and become very hard.
Found pure or in other ores, best combinations being in chalcopyrite, chalcocite, bornite and tetrahedrite. Unlike gold, the chalcopyrite sometimes called fool's gold is brittle when pounded and produces black streak. Found in igneous and sedimentary rocks particularly in Lake Superior region, also in Alaska, Arizona, California, Michigan, Montana, Nevada, New Mexico, Tennessee and Utah.	(1) Found extensively with chalcopyrite, sphalerite and galena in veins in igneous and in sedimentary rocks; (2) in oolites, columnar crystals in igneous rocks, red sandstones and with metamorphic rocks particularly in Minnesota, Alabama and Michigan; (3) in sands, beds, plates and lenses in Scandinavia and New York; (4) in beds, marshes, caves, on surface in Alabama particularly.	About 12 percent of earth's crust to depth of 10 miles. Found in veins, in granites, sandstones, sand, conglomerates, gneisses, schists, quartzites, rhyolites and pegmatite. Some of best crystals found in limestone in New York; others, in Arkansas. Amethyst gems of quartz from Brazil and the Ural Mountains, chalcedony from western states and Germany, and jasper from Siberia and Africa.	(1) Best from India, North Dakota, Virginia and North Carolina as commercial isinglass. (2) Best from Vesuvius and Canada. Lepidolite found with pink tourmaline in California and in Maine in coarse grains. Phlogopite, best from Canada where it is found in limestones and in serpentine. Micas may be in veins or disseminated through rocks.	Associated with feldspar-bearing rocks. Contributes to the muds coming from disintegrating granites, the quartz parts of the granite remaining as sand. Rather generally and widely distributed through the world.
Copper and tin, early used by bronze age man. Extracted by smelting, leaching or electrolysis. Used now in electric wiring, copper plating, roofing, piping, marine equipment, nails and money. A 1-cent piece is about 95 percent copper, 4 percent tin and 1 percent lead. Copper produced in United States in 1937 was worth $202,000,000, more than twice that of second-place Chile.	(1) in manufacture of sulphuric acid and as index in Africa of gold. (2), (3) and (4) as source of iron and (4) as yellow ochre in paints. U. S. production of iron and steel in 1937 about 88 million gross tons; twice that of Germany; nearly 3 times, Russia, 4 times, Great Britain, 8 times, France and 10 times, Japan and Belgium.	Used in crystalline form for gems, ornaments, optical and chemical apparatus, as sandpaper, in glass and cement; in massive forms as plaster, in soaps, pottery, paints, and as building stones. Sand and associated gravels in the United States in 1937 was worth approximately 100 million dollars. Quartz forms the rigid backbone of such valuable building stones as granite, sandstone and quartzites.	(1) Used as sheets in stoves and electrical equipment or ground to use in wall paper, as artificial snow for theaters or Christmas decorations, in paints, roofing and tires. (2) No commercial use. Lepidolite may be used in glass but phlogopite is the best of the micas for electrical uses. American micas are useful only in the inferior ways for the most part.	Used in making tiles, drain-pipes, bricks, stoneware, roofing, crockery, fire bricks, paper filler, and the finer forms in the making of porcelain and of china.

NAME OF MINERAL	**FELDSPARS** **(1) Orthoclase** **$KAl\,Si_3O_8$** **(2) Plagioclase** **$Na\,Al\,Si_3O_8$** **(3) Albite to $CaAl_2Si_2O_8$** **(Anorthite)**	**AMPHIBOLES** **(1) Tremolite** **$CaMg_3(SiO_3)_4$** **(2) Actinolite** **$Ca(Mg\,Fe)_3(SiO_3)_4$** **(3) Hornblende** **$CaMg_3(SiO_3)_4$** **and $Na_2Al_2(SiO_4)_3$** **and $Mg_2Al_4(SiO_6)_2$**	**SELENITE** **(Gypsum)** **$CaSO_4 2(H_2O)$**	**SERPENTINE** **TALC** **SOAPSTONE** **(1) $H_4Mg_3Si_2O_9$** **and (2) TALC or** **$H_2Mg_3(SiO_3)_4$**
COLOR, STREAK AND WEIGHT	(1) White, colorless, gray, flesh-red, vitreous. Streak, white or colorless. Weight, 2.5 to 2.6 that of water. Insoluble in acids. (2) Varied opalescent, vitreous to pearly. Weight, 2.62 to 2.75. All are silicates of aluminum and one or more other metals.	(1) White to light green. (2) Green. (3) Dark green to black. Luster, vitreous. Streak, colorless. Weight, 3 to 3.3 times that of water. *Asbestos* is a fibrous variety and *nephrite* is a tough, compact "green stone."	Colorless to white, gray, yellow or brown, vitreous to pearly, soluble in hot hydrochloric acid. Weight, 2.32 times as heavy as water. Streak, colorless. Selenite, transparent crystal. Alabaster, white, fine grained, translucent. Rock gypsum, coarse.	(1) Olive to blackish green, yellowish green to white or translucent when thin, with a greasy, waxy or silky luster. Streak, colorless. Weight, 2.5 to 2.65 times that of water. (2) Green to gray, pearly to greasy. Weight, 2.8 times that of water.
HARDNESS, FRACTURE AND CRYSTALLIZATION	Hardness, (1) 6 to 6.5; (2) 6, softer than quartz. Cleavage, (1) splits in 2 directions, 90° angle; (2) basal perfect, oblique. Structure, (1) crystalline, cleavable, to granular; (2) massive; cleavable, crystals rare. Crystallization, (1) Monoclinic, (2) triclinic. Fracture, uneven; in glassy crystals of (1), it may be conchoidal.	Hardness, 5 to 6, may be scratched with glass. Cleavage, perfect, prismatic at 125°. The minerals are opaque, semi-translucent or sometimes transparent. Crystallization, monoclinic, prismatic. Tremolite breaks into splinters which pierce the skin. Actinolite commonly occurs as plates or blades in schists. Hornblende is in short crystals in some volcanic rocks.	Hardness, 2, may be scratched with the fingernail. Unusual tenacity being both flexible and able to be sliced. Some varieties are fibrous. Fracture is in 3 directions, leaving rhombic plates. In selenite, the largest face looks pearly, while the other two show conchoidal fracture in one and fibrous in the other. Crystallization, monoclinic.	Hardness, (1) 3 to 5, usually 4; (2) 1, may be scratched with fingernail. Poor conductors of heat and not attacked by acids. (1) may have tough, fibrous or flexible varieties and subconchoidal or splintery fracture. (2) Has basal cleavage and may occur in fibrous or other forms, flexible but not elastic. Crystallization, monoclinic but true crystals of (1) unknown.
GENERAL RECOGNITION CHARACTER AND HEAT EFFECTS	Fusible with difficulty. Simplest difference is oblique cleavage in (2) and right-angle cleavage in (1). Prominent cleavage of (1) shows no striations; of (2) almost always shows striations.	Fusible easily with blowpipe. Hornblende, the commonest, appears usually as opaque black parts of basalts, schists and granites. It has a definite cleavage, thus differing from black tourmaline, which it otherwise may resemble.	May form crystals over 5 feet long or appear as massive, fibrous, granular or earthy material and may be identified by its hardness, its luster and its solubility in hot hydrochloric acid.	(1) Infusible. (2) Fused with difficulty but some kinds become very hard when heated excessively and are used as tips on gas burners. Color and general softness, the greasy feel to (2), and the general luster, are good identification characters.
WHERE AND IN WHAT FORMATIONS FOUND	Orthoclase, a potassium feldspar, is found as sanidine in common eruptive rocks like trachyte and rhyolite. Another potassium feldspar, microcline, occurs in large masses in pegmatite and similar rocks. Plagioclase includes the usually white soda-feldspar, albite, the dark gray labradorite and the usually lighter-colored sodium and calcium feldspar oligoclase.	Associates are suggested above. In schists, hornblende is usually fibrous or in blades; in volcanic rocks, in short thick prisms. Nephrite, the "jade" of New Zealand is compact but asbestos is fibrous. This is not the commercial asbestos which is made mostly from serpentine. Amphiboles are usually distributed through rocks but not always so.	Found generally in beds sometimes of great thickness commonly in sedimentary rocks associated with salt, calcite, sulphur, pyrite, dolomite and quartz. Best beds of selenite in Utah, Texas, Mexico and France; of alabaster, in Italy; of satin spar in Siberia, England and Nevada. Rock gypsum more generally distributed.	(1) Serpentine marble of the tougher forms quarried in England, Italy, Ireland, France, Greece, New England, along the Hudson near New York, and at Philadelphia and Baltimore. Chrysotile, a fibrous variety, makes asbestos. (2) Talc as soapstone is quarried in Virginia and North Carolina; the fibrous talc in New York and foliated talc in Rhode Island.
USE AND COMMERCIAL ABUNDANCE	Feldspar constitutes about 60 percent of the earth's crust to a depth of 10 miles. Feldspars, with mica, form the softer parts of granites. They are used in making porcelain, as a source of aluminum. Some are of gem quality; some in glass industry and in pottery. Found in granites, gneisses and sandstones. Some are used in building stones.	Used associated with the rocks of which they are a part. While asbestos may have 18 inch fibers it is not commercially used. Some forms have semi-precious jewel qualities and are used in making various ornaments.	Most important use of gypsum in making plaster of paris, also a part of cement and of general building plaster and land plaster. Alabaster is used in making statuary and carvings of various sorts; and satin spar, in making of ornaments. School "chalk" is made of gypsum.	Serpentine is used as building stones and the fibrous variety chrysotile is spun into yarn to make fireproof fabrics, heating pipe covers, fireproof shingles, stove linings and the like. Talc in its tougher forms is used as soapstones for washtubs, switchboards, tables, toilets and tanks. In its fibrous form it is used as filler for paper and paints and, in foliated form, in cheap toilet powders.

Spying on the Grass Spider

By MILO R. CLARE

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The mature grass spider (about three times enlarged), separated from the maze of low vegetation that is its normal habitat, is seen to be an alert upstanding individual.

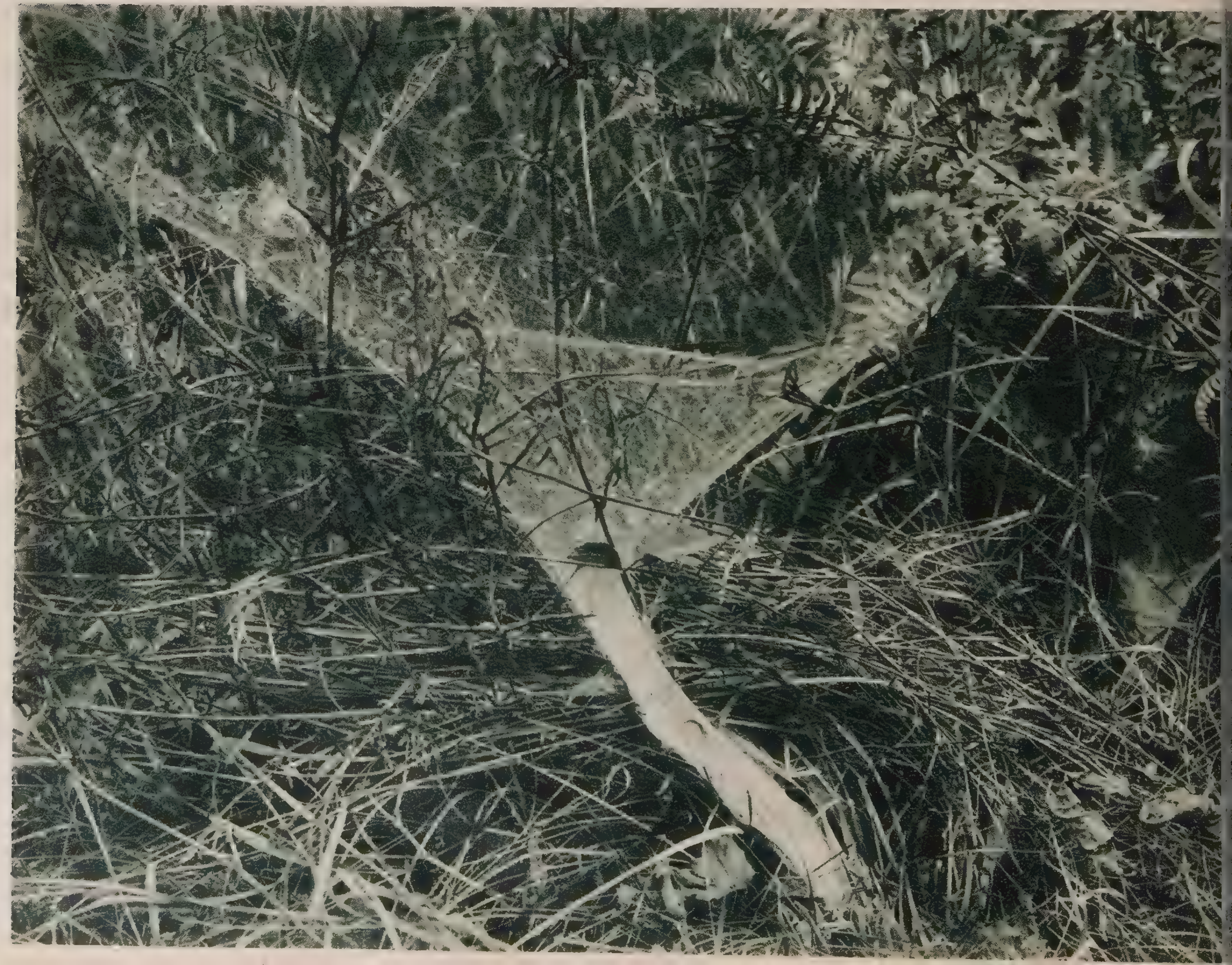
The first web made by the young grass spider is an irregular network of silken threads. With continued additions the lower part of the network becomes a horizontal sheet into which drop insects that are intercepted by the threads above.

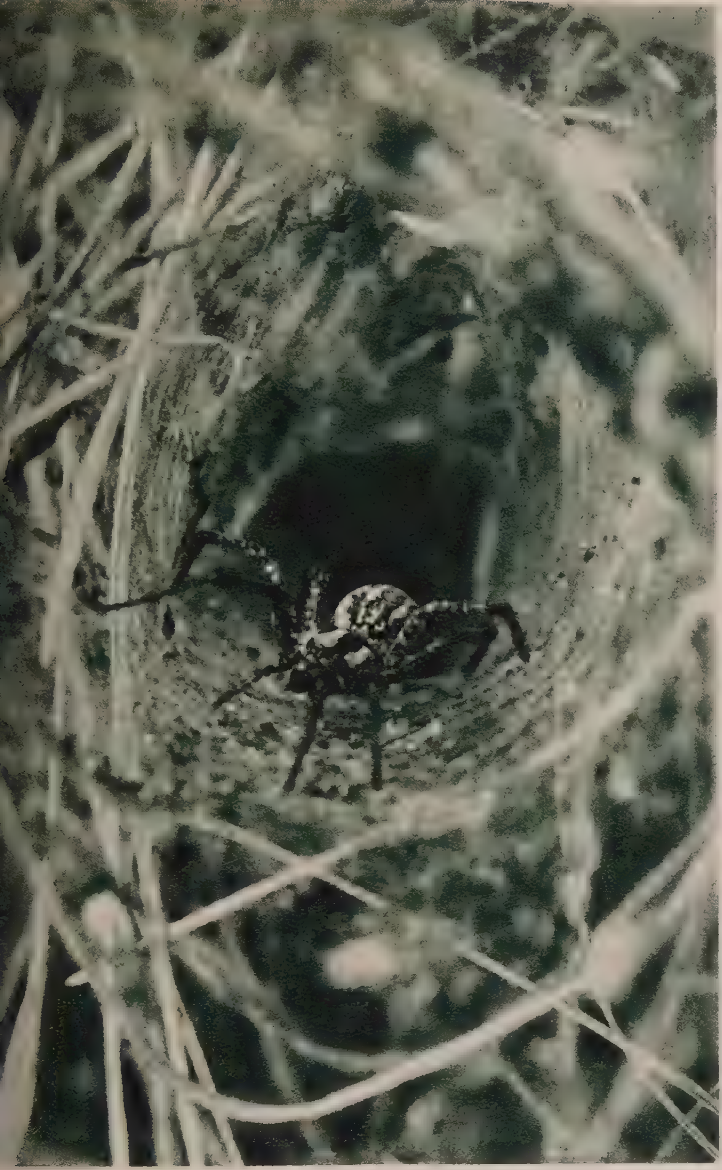
Few people are aware of the great abundance of spiders in their neighborhoods. This is because spiders are so secretive in their habits that we must detect their presence chiefly by the webs they erect. Yet many spiders do not spin webs at all, and, of those that do, the majority build structures of such surpassing delicacy that we pass them by without observing them. If, however, we arise early enough on a summer morning to see these webs when they are laden with dew, we will be amazed to discover a world almost covered with spider webs.

Prominent among these webs are those of the grass spider, *Agelena naevia*. This is probably our commonest spider, and it occurs nearly everywhere from the Atlantic to the Pacific. Were we to choose a national spider on the basis by which we selected a national flower, our choice might well be the grass spider.

Unlike the webs of many other spiders, which are practically unvarying in design and as perfectly executed by immature spiders as by seasoned adults, the web of the grass spider undergoes a development during the course of the season. Having selected a place of concealment in a crevice, or perhaps in the interior of a curled leaf, the very young spider proceeds to lay down in a nearby exposed sit-

Every time the spider traverses the horizontal sheet it reinforces it by laying down additional threads of silk. Thus it grows more definite and the irregular superstructure of threads gradually disappears. As the season progresses, the grass spider develops its funnel, attached to the main web. There it lurks ready to emerge and either consume any entrapped insect on the spot, or cut it loose and take it into the tube to be eaten later.





uation a criss-cross and formless maze of silken threads. This is the most primitive type of web conceivable, is intended to ensnare insect food, and is as inefficient as it is primitive. But it is merely a temporary expedient. Every time the spider ventures forth upon the web it deposits a fresh thread of silk, and thus soon converts the lower portion of the maze into a horizontal sheet-like structure. A large part of the original network persists, however, as a conspicuous feature of the web, appearing now as a superstructure of guy-lines and cables supporting the horizontal sheet. This superstructure lasts for some time and undoubtedly serves to arrest the flight of many passing insects, causing them to drop to the sheet below. With continued use the sheet grows more definite in character, whereas the superstructure is neglected and gradually disappears. Presently the web begins to take final form. On its excursions upon the sheet, the spider also extends its silken strands into its retreat at one side of the sheet, with the consequence that a tube is formed as an appendage to the sheet. Thus the entire web takes on the appearance of a lop-sided funnel. As the sum-

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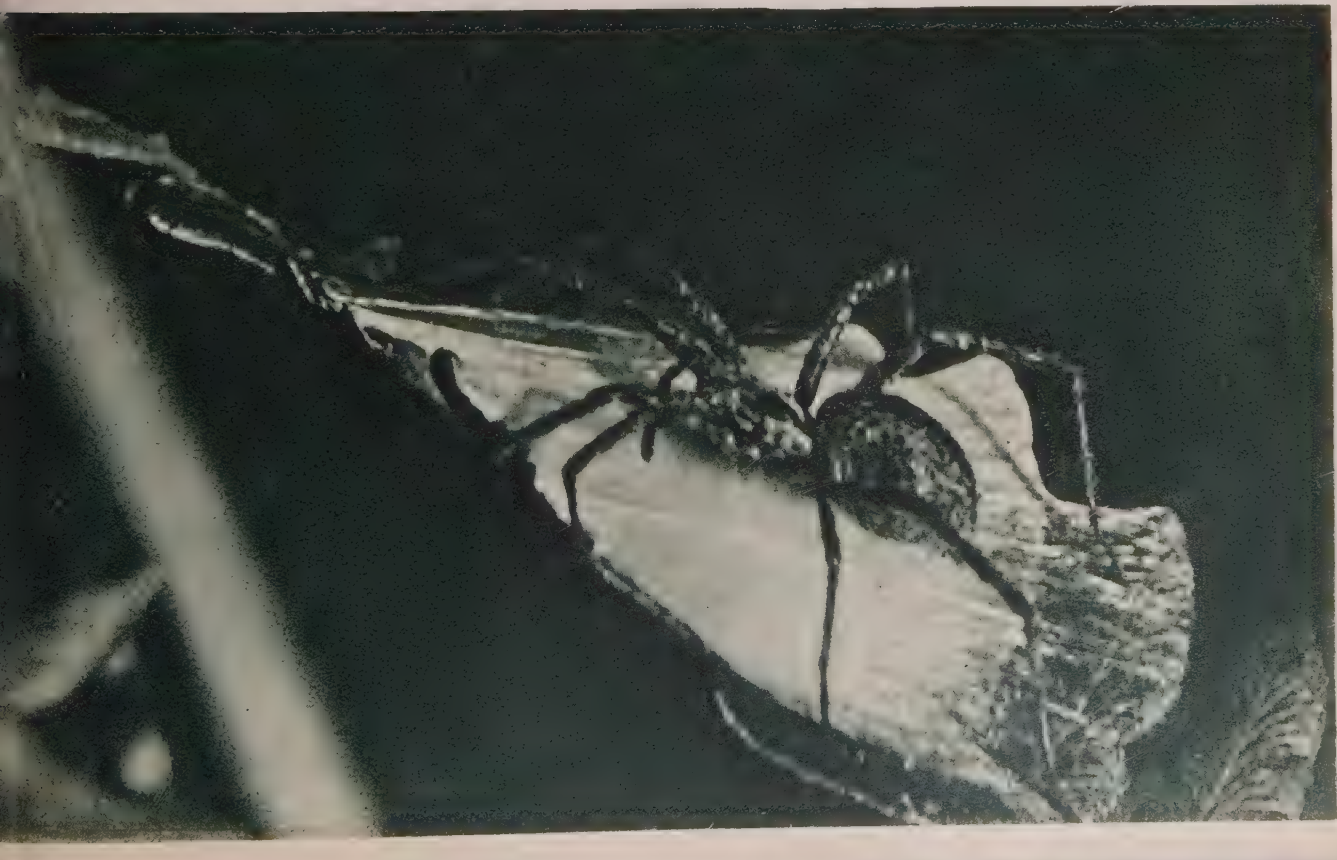
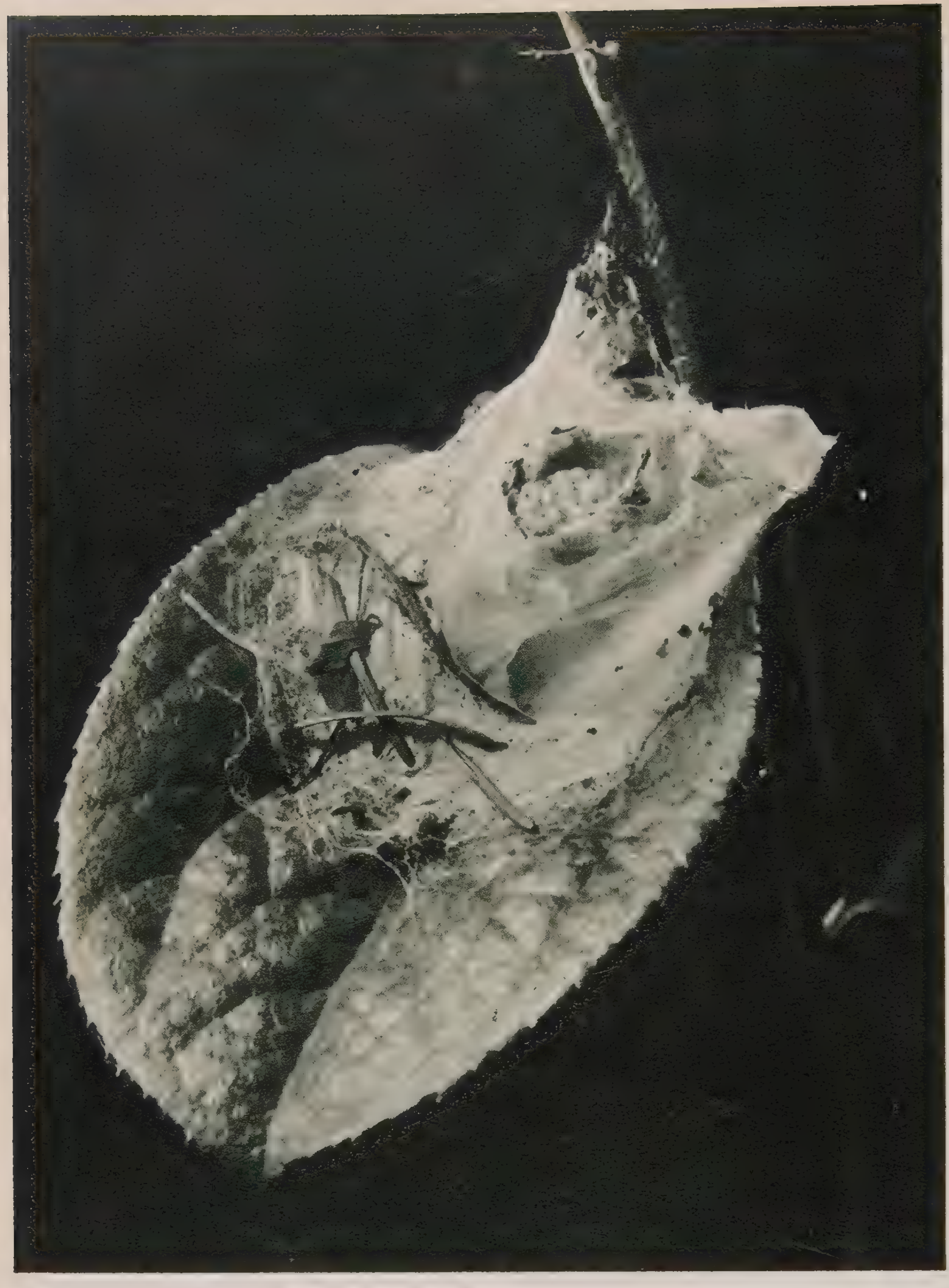
The grass spider spends most of the daylight hours within its tube, coming forth at night for web-building. Morning and evening, and often on cloudy days, it may be seen at the mouth of its tube.

The female grass spider adds the final touches to the egg sac, a task that takes twelve to eighteen hours. In the process her abdomen shrinks, for she builds into the egg sac both a large volume of eggs and a vast yardage of silk.





The egg sacs of the grass spiders are most frequently placed on leaves. In the sac shown here part of the cover sheet of silk has been removed, as well as several layers of the silk that forms the roof of the cup in which the eggs are encased. The silken cradle is waterproof and provides the eggs every possible protection. Usually the eggs hatch in the fall, but if the sac is made late in the season the spiderlings will not appear until the spring.

mer advances the funnel becomes more symmetrical, the retreat tube increases in length, and the sheet is spread more widely. Late in the season the sheet may be two feet in diameter and the stem of the funnel as much as eight or nine inches long. The spider lurks within the tube, at or near its entrance. From this position it can make quick assaults on luckless insects that fall upon the sheet. If too violently disturbed, it will run out of the lower end of the tube and conceal itself amid the litter covering the ground.

In early fall the males desert their webs to seek out the females. The egg-sacs may be found from the middle of September onward, hidden in crevices or attached to leaves. In making the egg-sac the female spins a foundation of silk on which she deposits about 200 pearly eggs. She then enfolds them in several layers of loose-spun sheeting. Finally, over all, she places a heavy silken cover. When the egg-sac is formed on a leaf, not infrequently another leaf is bound down over the surface of the egg-sac to protect it more adequately.

In the milder parts of the country the spiderlings hatch out in the fall months; elsewhere, the eggs continue through the winter and produce a spring crop of young. Whether hatched in the fall or spring, each spiderling selects the first warm sunshiny day to enact a strange practice of a strange race. From its spinnerets issue long threads of silk that are arranged into a sort of balloon, which, with the help of ascending currents, enables its passenger to rise to the air-lanes of travel, there to be borne willy-nilly far from its place of birth. When the impulse to travel is satisfied, the support is reeled in and the rider descends to take up a new abode.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

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RESOURCES OF THE PACIFIC

As a leading article this month, Nature Magazine presents a story of the sea otter. It tells of the recent discovery of a pitiful remnant of this once great resource of the Pacific Ocean; a sea mammal that formerly had great economic importance as a source of valuable fur, and which was almost exterminated by over-exploitation. With rigid protection over a period of years, the sea otter might come back to at least a suggestion of its former numbers. But this protection must be international; without exception; absolute.

When we consider the fate of the sea otter, we may logically turn attention to consideration of other invaluable resources of the Pacific—the salmon of British Columbia, Alaska and our own Northwest, and the fisheries of Hawaii. Both are seriously menaced, and both must be administered in accordance with a plan of conservation based upon scientific knowledge.

The problem of the salmon is an international one, involving diplomatic relations, and potential with conflict. But we are heartened by the fact that, through an agreement between the United States and Canada, which resulted in the creation of the International Fisheries Commission, the seriously depleted halibut resources of the coast, from California to the Bering Sea, were restored. Also, a policy of salmon fishing was established designed to assure the perpetuation of the supply.

A complicating factor has arisen, however, with the appearance off Alaska of Japanese fishing boats and floating canneries. Whether this shift came because of the protest of the Japanese salmon monopoly on the Siberian coast, or because of the failure of Russia to renew Japanese fishing rights on that coast matters little. In any event it created a serious menace to America's existing program of conservation and use. Informed individuals are convinced that continuation of the unrestricted and destructive fishing by the Japanese will mean the destruction of our salmon industry in a decade. Together the United States and Canada have spent time and money, and have applied restrictions to perpetuate the supply, yet precedent, if not actual law, limits their jurisdiction to the "three-mile limit."

There is a substantial and sound body of opinion, however, that considers the three-mile limitation unsupported by actual international law, or general acceptance. It is further pointed out that since the salmon are reared in North American lakes and streams, Canada and the United States have special rights to these fisheries that other nationals must respect. Also the relatively shallow region of the continental shelf, which extends a few miles into the ocean from the California coast, but broadens to about one hundred miles off Alaska, is the normal feeding area for the salmon, and is, in reality, a part of this continent.

In any event, we are confronted by no theoretical problem but one that is practical and demands immediate action. The solution should come through diplomatic channels and should be sought without delay. Further, the United States and Canada should let it be known without equivocation that they regard their special interests in these fisheries as entitling them to maintain their present policies in salmon conservation.

Another fisheries problem of the Pacific relates to the fish resources of Hawaii, and to the urgent need both of knowledge of existing conditions and proper supervision of the annual catch. A look at the past must convince anyone that the fishes of the oceans are not inexhaustible; that unrestricted harvesting anywhere cannot go on indefinitely.

Before he retired as United States Commissioner of Fisheries, Frank T. Bell recommended a thorough investigation of the fisheries of Hawaii and adjacent waters. He proposed that this study be directed toward rehabilitation, and "for more complete exploitation of resources capable of fuller utilization." He also stressed the need of studying more efficient methods of fishing to assure greater profit and more employment.

There is, in fact, more of the commercial and less of the conservational in Mr. Bell's proposals. This is consistent with Mr. Bell's general attitude as Commissioner. Fundamentally, however, it is right. An *unbiased,* thorough and scientific study of the ecology of north-Pacific marine life should be made, and made immediately. On the basis of these findings a program of development and use, based upon sound conservation and maintenance of an adequate supply, should be established. It is also interesting to recall that about twenty years ago a well-planned study of the entire marine resources of the north Pacific was urged by a group of eminent American scientists.

We cannot continue to play fast and loose with the finny resources of the seas as we have done with the resources of the land. If we go blindly on exploiting they will follow the sad course of the mammals of the sea—the whales; the seals; the sea otters.

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"VERMIN" HUNTS IN WASHINGTON

Truth, proved facts and scientific knowledge always must fight an uphill battle to overcome ignorance, misinformation and just plain cussedness. In no instance is this better demonstrated than in the struggle to save our hawks and owls, and other so-called "vermin", from the ignorant drives against them.

In many parts of the country distinct progress has been made. Intelligent sportsmen have studied and accepted the incontrovertible proof that the majority of the species of hawks and owls perform an invaluable service in the scheme of Nature. Informed farmers have accepted the facts that these birds are important allies in checking injurious rodents and insects. Truly conservation-minded game officials have sought the passage of laws protecting these valuable bird species, and have demanded the enforcement of these laws.

But, despite this progress in many regions, there still remain states where stupidity and ignorance continue to prevail; where facts are ignored in order that members of sportsmen's groups may have something to shoot at out of season. Accurate information about the feeding habits of these birds has, therefore, been zealously ignored. "Vermin" hunts go on, stimulated by bounties, contests and prizes, the latter often donated by arms and ammunition dealers.

Of all the states the State of Washington is perhaps in the forefront in the number and character of its "vermin" hunts, predatory drives and bounty payments. On the statute books of the State the beneficial hawks and owls are protected, but the State Game Commission is making no real effort to enforce the law. If it were, the widespread hunts would not be permitted, if only because not one hunter in a hundred can accurately identify the species of hawks and owls, least of all on the wing.

To our knowledge thirty-eight "vermin" hunts are being conducted by groups in Washington State. There are probably more. Most of these are under the auspices of sportsmen's associations. Several are sponsored by ammunition dealers. One high school boys' club, one woman's club and one Grange also conduct contests. And we are surprised to note that one chapter of the Izaak Walton League not only conducts such a vermin contest and pays bounties, but includes on its proscribed list the great blue heron, a bird protected both by State and federal law.

It is interesting to note, as examples of the ignorance and misinformation on which these drives are based, that the Okanogan Wildlife Council includes eagles in its hunt. The bird is protected by State law. The Tonasket Game Protective Association pays a twenty-five cent bounty on large hawks, the most beneficial species. The Pend Oreille Valley Sportsmen's Association proscribes sparrow hawks, which are protected by State law. Almost without exception the terms of the contests, or the listing of bounties paid, proscribe all hawks and make no distinction as to species. Under State law all hawks but the three accipiters—the goshawk, Cooper's hawk and sharp-shin—and three falcons—duck and pigeon hawks and prairie falcon—are protected. The great horned owl is the only unprotected owl. Points are given, or bounties paid, for "hawk and owl eggs and young" regardless of species. In practically every instance only the feet of the hawks and owls are required for credit, thus making it impossible for the judges to discriminate between the species.

That the Washington State Game Commission takes no steps to educate the organized sportsmen of the State, but, rather, tacitly encourages the "vermin" hunts by inaction, is discouraging to conservationists and to all informed sportsmen. The facts of the food habits of hawks and owls are established beyond argument. The great economic benefit of most species is proved. The continuance of these predator control contests in the name of conservation is a travesty.

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WATERFOWL SEASON ★ ★

One less goose per day per hunter—this sums up the difference between migratory waterfowl hunting regulations in 1939 and 1938. Fortunately the bans on the use of live decoys and hunting over baited waters are retained, and the dubious situation of the goose population is recognized by cutting the bag limit from five to four.

Those hoping for assurance of more rapid increase in the naturally-produced supply of birds, however, will find little comfort in the regulations. The zone system is retained, together with the 45-day open seasons, forcing many of the waterfowl to run a gauntlet of shooting of more than four months duration. No protection is afforded the canvasback, redhead, ruddy and bufflehead ducks. The two-day possession limit is continued.

Reports indicated a modest increase in numbers during a favorable breeding season. Perhaps we should find solace that this increase has not been reflected in an even more liberal set of regulations. We are not, however, as resigned as that and can only regret that real restoration of waterfowl numbers is to be still further delayed.

"A Soft Answer..."

It not only turneth away wrath but may be a force for good

By BERTHA CONRAD HALL

Photographs by Frank L. Du Mond, Grand Rapids Public Museum

C. P. L.

NATURE PREPARED A FEEDING STATION

And the young bird feeders take advantage of the hollow in the old tree stump

IT ALL started over a blue racer. We had found it taking a siesta in the October sunshine not far from where carpenters and painters were renovating our "dream home". After we had explained to our four daughters that the snake was harmless, and would be a good friend to have in our projected perennial garden, "Blue" was accepted into the family.

One afternoon, not long after, Connie rushed in to report breathlessly that some boys, cutting cross-lots on their way home from school, had killed "Blue". I found him draped over a low limb of one of our oaks, quite dead. And my protest to the boys was met with catcalls, followed by a shower of pebbles.

Next, by way of the children's "grapevine", I learned that a favorite pastime of some local small boys was to insert straws in baby birds and blow them up until they burst. Clearly there was need for action, so I set out to "woo" the boys. Plates of fudge "just happened" to be on hand; bacon-wrapped hot dogs, cooked in an outdoor fireplace, proved popular; a marshmallow roast on a warm evening was a high point. Seed for my garden began to be brought in appreciation. Finally, one little fellow said:

"Gee, Mrs. Hall, we're sure sorry we killed that snake. But he might 'a killed you if he'd 'a bitten you."

This provided an opening for a Nature discussion, and by spring I had to work in shifts the helpers who came to clean leaves from the rock garden. The resting ones watched the newly-arrived spring birds. They reported new activities in the bird world, and watched, through my husband's treasured binoculars, a strutting male grebe in the little swamp. Billy, who admitted he had killed a grebe last year with a huge slingshot, spied the first red-headed woodpecker. The next day he came to me and gravely handed me the slingshot.

"I guess I'm all through with killing birds—even sparrows. Somehow I like to look at 'em through Mr. Hall's glasses better," he volunteered.

Progress was really being made, and it was at the meeting of the Michigan Audubon Society in Grand Rapids, on the outskirts of which we live, that revealed the next step. Margaret Gross, the secretary, suggested that we form a recruit group for the Audubon Society. Miss Mary Peterson, teacher of the fifth and sixth grades at the Oakview School, had been thinking along the same line. So, with the approval of the school board, members were invited, annual dues to be fifteen cents. Eight, I thought, would be all we might expect. Twenty-six members joined and paid dues at the first meeting, and the first and second grades sought to trail along on the first hike that followed the meeting. They were so plainly brokenhearted at being turned back to school that an overflow hike had to be organized immediately.

MANY FEEDING STATIONS WERE SET UP

These were kept supplied with food during the season of sparse supply

From this first beginning membership and interest have grown. Although the Oakview School has only about 150 children, an attendance of 125 at meetings is common. The first Christmas there was a tree, all presents being for the birds. There were boxes of screened gravel, bread crumbs, sunflower heads, flower seeds, chicken feed, oatmeal, corn for pheasants and a sheaf of wheat to put up on a pole. Similar events have marked succeeding Christmases.

At the first Christmas party each member was given an opportunity to report bird experiences. One boy popped up with a question.

"Our next door neighbor shot a hen pheasant yesterday right by my earcorn on the fence by the orchard," he said. "What shall I do?"

It was Christmas. The pheasant season was long over and hen pheasants were protected anyway. There was a heated discussion, with suggestions of direct action. So I closed the door and we carefully worked out a program. We would not report violations of neighbors but would ask the fathers and mothers to help stop violations in any way they thought best. It was a plan that has worked wonders.

Beyond bird study, feeding and other avian attentions, we set ourselves a greater goal. It was to get permission to post a sanctuary, taking in our own swamps and woodlots and other adjacent area. The president of the school board, Irving Woodworth, dedicated forty-five acres. Then, with the weight of child opinion and influence an important factor, other lot owners were reached and their cooperation enlisted. The children rejected the idea of a state sanctuary with metal signs furnished by the conservation department. They wanted their own signs, bearing the name of the Oakview Audubon Recruit Group and the lot owners. The sanctuary is now a fact, and fathers and grandfathers have been busy wielding paint brushes on the signs.

During the two years of working for the sanctuary many bird feeding stations were erected and kept supplied with food. Houses were put up. Mothers, not wanting to be outdone by the youngsters, asked for a mothers' walking group. Parents contributed to build up a complete file of Nature Magazines and a library of books. Bird study has been placed on the schedule of all of the teachers. Children from Grand Rapids have come for bird study in the Oakview Sanctuary. Various programs have been put on, including one parent-teacher-association meeting that proved such a success that the entertainment had to be given twice to care for the overflow.

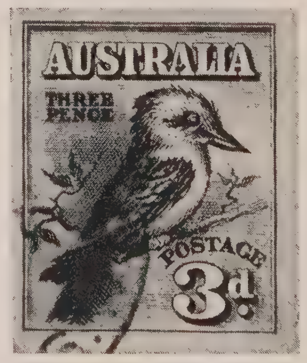
So successful and so sound has been the growth of this work that the groups became too large for Miss Peterson and me to handle. So four eighth-graders were chosen as associate leaders in charge of hikes. And one of these eighth-grade boys is the youngster who killed the blue racer because no one had told him any better.

The Kookaburra

By EDITH M. LAING

Among Australia's interesting postal pictures is one showing the laughing kingfisher, peculiar to that country. Because of its strange calls this bird was named kookaburra by the aborigines, and by the colonists, laughing jackass.

Those poetical legends that account for the origin of kingfishers—of the romance of Ceyx, son of the Morning Star, and Halcyone, daughter of Aeolus, the wind; and the tale of the kingfisher that, released from its cramped quarters in the Ark of Noah, flew so high that its back took on the color of the sky, and its breast was scorched brown by the sun—these pertain to the typical kingfishers, the real fishers that live by the waterside in many a country. The bird that now concerns us, however, belongs to a group whose food habits allow them to live in the woods, or even in semi-desert areas. These are the wood-kingfishers or king-hunters, which inhabit various island groups in Oceania. There are many species, some of beautiful color and all with strange habits. With its share of the latter traits, but with little beauty, is the kookaburra. Its back is dull brown, changing to greenish-blue toward the tail. A wide collar of white encircles the neck, and this color continues over most of the head to the eyes, and down over the breast. The tail feathers are tawny, with black bars and white tips. It is a truly distinctive member of the clan.



The scientists call this bird *Dacelo gigas,* which means, of course, the great kingfisher. It has a rather extensive range in Australia, being equally at home in patches of scrub on the drought-stricken plains of the interior, and in the verdant bush of the highlands. Nor is it restricted as to diet, for a variety of insects, lizards, snakes, crabs and mice find a place on its menu. Its favorite nesting place is a well-hidden natural cavity in a tree, and here it deposits its white eggs.

From the profile view on the stamp one gets the impression of a gay and roguish disposition. How natural for these comical birds in their unfettered state! But when seen as wretched captives hunched on a perch in a zoo, every feather voices utter dejection, while listless eyes, the light of liberty forever dimmed, bespeak the bitterness of a broken spirit.

But let an Australian naturalist, Wheelwright, give us a happy picture of our irrepressible bird, which the settlers sometimes call the bushman's clock: "About an hour before sunrise the bushman is awakened by the most discordant sounds, as if a troop of fiends were shouting, whooping, and laughing around him all in one wild chorus. This is the morning song of the laughing jackass warning his feathered mates that daybreak is at hand. At noon the same wild laugh is heard, and as the sun sinks into the West, it again rings through the forest."

Things to Think About

Prizes totalling more than six hundred dollars were awarded to inventors and trappers by the American Humane Association in its 1939 humane trap contest. Through these contests, conducted for the past twelve years, a world-wide search has been made for devices that will assure the trapping of wild animals with a minimum of attendant suffering. The Association's wildlife director, W. E. Sanderson, declares that "years of research have brought us nearer our goal of enlightening the world concerning true conservation and the justice due our wild life."

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A most practical and helpful little loose-leaf booklet entitled *Conservation Guide* has been published by the conservation committee of the Garden Club of America, 598 Madison Avenue, New York City. It is divided into three parts—education, planning, preservation—and serves as an aid to local conservation committee leaders in suggesting the general program and in advising where to turn for additional material.

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Twenty new national wildlife refuges have been added to the U. S. Bureau of Biological Survey system of refuges in North Dakota. These new areas brought 35,495 additional acres under refuge management, while 11,135 acres more have been added to the existing Long Lake Refuge in that state. These areas are not only important for migratory waterfowl, but also serve as water conservation projects.

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Careful removal of eiderdown from nests of the incubating eider duck without interrupting the raising of the family is providing a new industry and aiding conservation of these birds in Quebec Province, Canada. A source of much-needed financial aid to residents of the regions where these ducks nest, the stringent laws protecting the birds are further aided by the fact that the more eiders there are the more down. Hence those collecting the down are individual game wardens. There has been a five-fold increase in the amount of down gathered since 1933.

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The Problem of the Roadside is the title of a report brought out by the New England Regional Planning Commission, 2100 Federal Building, Boston, as publication No. 56 of that body. The report regards rural zoning as one of the most effective means of roadside control, but points out that there are legal problems to be solved in order to make this effective in New England. The report deals rather gently with the worst offender along the roadsides—the billboards—confining its comments largely to factual information on the progress of billboard control thus far. A much more exhaustive analysis of this question is to be found in the American Nature Association *Quarterly Bulletin,* Volume 2, Number 2, available on request.

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Many young squirrels have died of starvation in Illinois this year due to the ill-advised and uninformed action of the State Legislature. By legislative fiat the open season on squirrels was set for July 15 in the southern part of the state, and for August 1 in the central and northern zones. The season was thus advanced from September 1, ignoring the fact that in usual warm summers squirrels raise two families, one in the early spring and the other in late July. Thus the many mother squirrels shot during the early season have left unfed young to perish. The Director of Conservation states that he was not consulted about this action, nor was he informed of the matter until the legislation had been approved by the Governor.

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The Appellate Division of the Third Department of the Supreme Court of the State of New York has upheld as constitutional the provisions of conservation law regulating the erection of billboards within Adirondack Park. This law was passed to protect the beauty of this area from unsightly exploitation of this sort, and was contested through a case brought by the State against Joseph S. Sterling, who defied the law by erecting several large signboards.

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Homer W. Wood, California newspaper publisher, inveighs against the National Park Service because it does not kill off the predatory animals in the National Parks. He cites the fact that in the Canadian National Parks predator control is carried on, and that our own National Parks, without such a policy, cannot function as game refuges. Mr. Wood loses sight of two things. The first is that the National Parks of Canada are not founded on the same basis as our own, but are designed to serve a wider recreational purpose, including hunting, much as are our National Forests. Secondly, our National Parks are not established as game refuges but as wildlife sanctuaries. There is a distinct difference between the two, although both terms are too often mistakenly used. For example, the game refuges of the United States Biological Survey are often called sanctuaries despite the fact that in most of them there are areas of public shooting grounds available for hunting during open seasons. A game refuge is an area with hunting significance and a game management philosophy. A wildlife sanctuary is an area where all wildlife enjoys protection all of the time and exists under undisturbed conditions of Nature. Mr. Wood, it appears, is a game conservationist instead of a wildlife conservationist, and looks at the National Parks as reservoirs from which game should flow into areas where it can be shot. Hence he is interested primarily in the game animals within the Parks. Wildlife conservationists have a broader interest and will uphold the existing policies of the National Park Service with respect to predator control.

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On the grounds of the Greenhead Hunting Club of Fallon, Nevada, leased for hunting from the Truckee-Carson Irrigation district, 10,263 ducks were killed in the 45-day season of 1938, compared with 4440 in the 30-day season of 1937, according to information published in the *Fallon Standard* just after the close of the 1938 shooting season. The average daily bag was 7.1 ducks per hunter. On five days during the season all hunters killed the legal limit. Yet the caretaker of the club wants a three-day-a-week season, to extend from September 1 to January 1. Two flocks of swans observed in flight numbered 85 and a little more than 100 respectively. One hunter who boasted of the largest goose he had ever shot, which reached from his shoulder to the ground, had, undoubtedly, killed a swan, but the bird was not seen by the caretaker. Evidently the hunters' bags are not always closely checked as to species.

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"The intelligence of the American people is insulted by the thousands of billboards which scream at them for mile after mile," declares the editor of *Florida Magazine* in the leading editorial in his August issue. Proud of his state and the beauties with which it is endowed, he strikes out against this condition in an effective and thought-provoking statement, which we reproduce, in major part, here. Says Editor Jess G. Lantz:

"Just how long are the people of Florida going to allow their beautiful highways and traffic thoroughfares to be cluttered up with nondescript signs and billboards? Big ones, little ones! Old ones! Ugly ones! Glaring, screaming billboards! Ragged, battered and bent signs. They leer at you from trees and yell at you from ditches—they come rushing at you from over the hilltops and gnaw at your vitals from around curves—steam heated . . . liver pills . . . inner spring . . . baffle cars . . . b-o tonic . . . the whatis hotel . . . squirma shav . . . and by the time you've gone a few miles your head is in such a whirl trying to ignore the obnoxious things and keep from reading them, that before you know it you start dodging them as if they were racing toward you.

"Billboards and signs on the highways are a menace to safety and a curse on our virgin forests and broad landscapes. Besides that, they are a travesty on the intelligence of the American people. Everywhere you go these glaring illegitimate children of the graphic arts are practically 'rammed down your throat' in a manner that is most distasteful to an intelligent person.

"Highway and automobile safety has lately received a great amount of attention in all sections of the country, but the sign and billboard nuisance goes on its merry way unmolested. In Florida many of these huge billboards are so placed that they are a direct obstruction to the vision of motorists. Even those that are farther removed from the roadbed are still a menace to safety because of the fact that they ofttimes divert the attention of drivers from their all-important responsibility of operating their vehicles.

"We believe the large users of billboard space in Florida would be happy to have the nuisances removed from the highways. Most of them probably use this kind of advertising because some competitor started it, and they would be glad to be relieved of this expensive method of destroying the beauty of Florida's highways. A very few of the signs—those which are solely for the purpose of directing motorists over shorter or better routes—are excusable. We believe the State Road Department should be given authority to limit the size and define locations of signs and billboards—let Florida lead the Nation in a program of true highway beautification."

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Receipts from the sale of forest products from the 158 National Forests during the fiscal year ending June 30, 1939, amounted to $4,870,516, according to a report by the United States Forest Service. This represents an increase of more than a quarter of a million dollars over the figure for last year but is still about two million dollars less than the 1930 record. Timber sales accounted for more than half the total revenue last year. Grazing fees were down due to lower market prices for lamb, wool, mutton and beef. In fact, over the years National Forest receipts have proved a quite accurate indicator of general economic conditions.

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During the year that ended June 30 more than 1,600,000 acres were added to the scenic, recreational and historical areas administered by the National Park Service. This brings the total acreage to 20,817,228 acres as of July 1, 1939. The extension of the Glacier Bay National Monument, which was increased by the addition of 1,124,720 acres, and the enlargement of Carlsbad Cavern National Park from 10,080 acres to 49,568 acres, were the most important additions. Badlands National Monument of 150,103 acres was another important increase.

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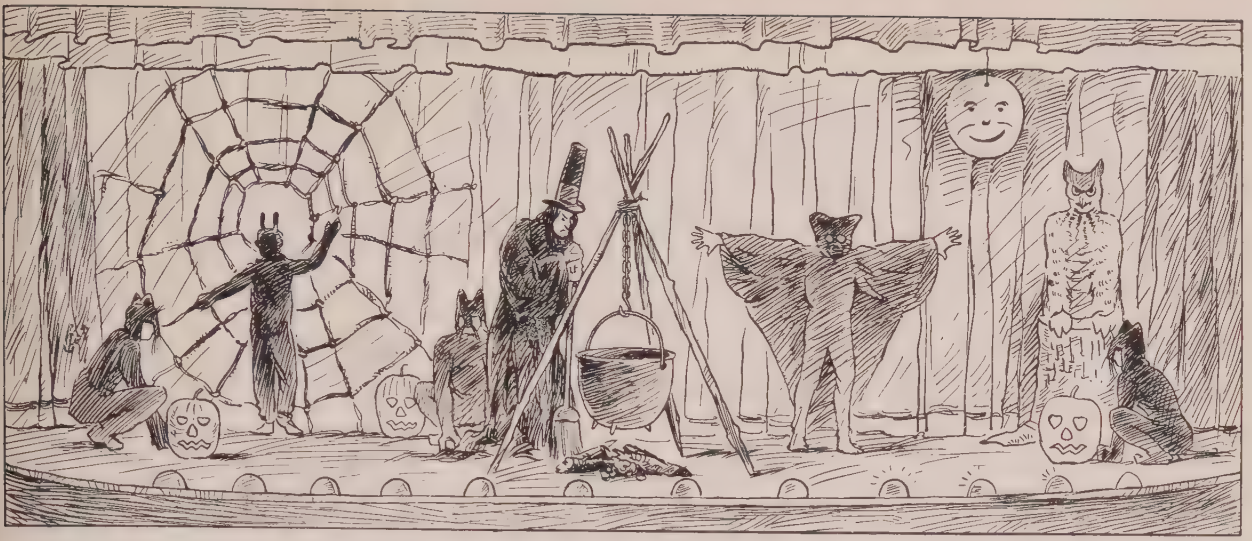
To provide an item on the menu of the official banquet tendered the British King and Queen in Quebec more than two thousand slate-colored juncos were slaughtered. Such an act was in direct violation of decency and of the spirit, if not the letter, of the Migratory Bird Treaty Act between Canada and the United States. Protests arose even before the banquet was served, and it is understood that Their Majesties did not partake of this course. More protests have followed, and it is hoped that they will be in such volume as to preclude any repetition of such a practice.



A Hallowe'en Brew

We have received numerous requests for suggestions of sources of simple Nature plays. Survey of the field reveals them to be scarce. So, with the hope of getting reaction as to the usefulness of this type of material, we present herewith "Hallowe'en Brew". It is the result of collaboration between members of the sixth grade groups of the Princeton, New Jersey, elementary schools, and their teacher of Nature study, Dorothy M. Compton. Other groups using this for a school play may wish to elaborate it, but this Princeton version offers a working basis.

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Characters: 1st Witch; 2nd Witch; 3rd Witch; 1st Black Cat (Binzing); 2nd Black Cat (Coal Black); 3rd Black Cat (Jo-Jo); Owl (Spooky); Spider; Two Bats; 1st Child; 2nd Child; 3rd Child; 4th Child; 5th Child.

Scene: A witches' hut. Spider web constructed of heavy black yarn in left corner. Spider stands in web, occasionally moving arms and legs as if weaving. Caldron hanging from tripod in center stage. Owl on stump in right corner. Bats resting against curtains in rear, occasionally flitting wings. Light from three pumpkin Jack-o'-lanterns, and moon overhead.

As curtain opens, Spider, Owl, and Bats are alone on stage.

SPIDER: Tonight the old witch makes her brew!

OWL: Yes, I know. This is Hallowe'en.

BAT: Here she comes! Sh! Sh!

(*Enter 1st Witch on broomstick, with her black cat*)

1ST WITCH: What are you whispering about?

BAT: Oh—er—ah—we were talking about the delicious brew you make. Isn't this the night? It's Hallowe'en, you know.

1ST WITCH: Yes, yes! I know. It is time to begin the brew. Come sisters!

(*Enter two more witches and their black cats. The three witches walk round and round the caldron, peering into it*)

1ST WITCH (*stirring*): Round and round our magic brew. Stir until it is very black. Ha—ha—ha—ha.

2ND WITCH (*shaking something from a bag into caldron and stirring*): Put in warts of a toad, an eel, and a snail to make the people quiver and quail. Ha—ha—ha—ha.

3RD WITCH (*shaking something from her bag and stirring*): Put in some slimy snakes and a mouse or two, stir round and round our magic brew. Ha—ha—ha—ha.

(*1st Witch tastes brew*)

2ND WITCH: How is the brew, sister?

1ST WITCH: It is not rich enough. We must put in more. Binzing, come here. (*Cat comes up, meowing*) Binzing, go get beetles and flies and elephants' ears. We also want some more bats' livers. Hurry back, because our brew must be done before midnight.

BINZING: Yes, Old Witch. Meow! (*Goes off*)

2ND WITCH: Coal Black, come here. (*Cat comes*) Go get twenty rotten eggs.

COAL BLACK: Yes, yes, Old Witch. I'll get six dead rats, too—meow—to put in this delicious brew.

2ND WITCH: Be off with you and get them quickly. (*Cat goes off*)

3RD WITCH: Jo-Jo, come here. We need lots more scary animals to put in our Hallowe'en brew. Jump on my broomstick and fly quickly. Bring back some squirming worms, a rabbit's nose, a lizard's tail, and a monkey's toes. (*Cat goes off*)

1ST WITCH: Wake up, bats. Hallowe'en is here. It is the time to scare people. What are you going to do tonight?

BAT: That's easy. We shall flit around and swoop down at people and make nests in their hair.

2ND WITCH: Good, bats. We depend on you to scare lots of people.

(*Spooky hoots*)

3RD WITCH: What's the matter, Spooky?

OWL: Shall I scare people, too? I can hoot under people's windows and make them think they are going to die. Like this—(*Hoots*)

3RD WITCH: Good, Spooky. We must remember to tell the dogs, too. They must howl and howl to make people think someone in their house will die.

1ST WITCH: Here come the cats. On with the cooking. (*Enter cats with sacks of things*)

2ND WITCH (*emptying sacks into caldron*): Perfume of skunk, poison of rattlesnake, crawly caterpillars, and thousand-legged worms, fall into our pot. Ha—ha—ha—ha. (*Tastes brew*)

3RD WITCH: How is the brew now, sister?

2ND WITCH: Better, better, better. But it still needs more. Some of your poison, O Spider. (*Spider spits into caldron*) And we forgot the frogs' legs to sweeten the brew. A pig's curly tail would make it taste good, too. (*Pulls these from her pocket and drops them in, too*) Now stir it with the black cats' tails.

(*Cats stir while witches recite*)

THREE WITCHES: Stir—stir—stir, bubble—bubble—boil, dragons' blood and livers of bats, stirred and mixed by three black cats. Stir—stir—stir.

1ST WITCH: Ah, how rare this brew will taste! (*All taste*) The brew is done. Now listen, all you animals. Do you know your work for tonight? Bats, you are ready. Owl, you are, too. Black cats?

BINZING: Yes, Old Witch. We shall yowl and yowl on people's back fences. (*Yowls*)

COAL BLACK: And we shall run across their paths.

JO-JO: And they will have bad luck. (*All cats meow*)

3RD WITCH: Good, Cats. Now we must round up all the other things people are afraid of. We must find the dragon flies and tell them to sew up people's ears and doctor the snakes. People call them darning needles and snake doctors. Ha—ha—ha—ha.

2ND WITCH: Yes, and the mice to run up the ladies' skirts and scare them.

1ST WITCH: And the toads to give them warts. (*All the witches laugh*) We shall scare everyone this Hallowe'en. You animals watch this brew while we call the rest. (*Witches go off*)

(*Left alone, the bats flit about, squeaking. Spider spits again in brew. Cats play. Voice of child is heard off stage*)

1ST CHILD: We had better hurry or we will be late for Janet's party.

BAT: Here come some children. Now is our chance. Let's practice our pranks on them and see if we can scare them.

(*Enter five children, dressed for Hallowe'en party. Cat yowls and runs in front of them as they enter*)

2ND CHILD: Oh, there's a black cat! It ran right in front of us. Now we'll have bad luck.

3RD CHILD: Nonsense. You don't believe that old superstition, do you? Black cats are no different from white or gray or any other cats. They haven't anything to do with luck. Let's hurry. (*Owl hoots*)

4TH CHILD: What was that? I'm scared!

5TH CHILD: Scared of an owl hoot! Silly girl! (*Laughs*)

4TH CHILD: Now I *know* we'll have bad luck. When an owl hoots it means someone will die.

5TH CHILD: Don't be silly. An owl hoot might mean a mouse or a rat would die, if the owl could catch them, but they don't hurt people.

4TH CHILD: Well I don't like that sound and I'm afraid!

(*Bats flit close to children*)

2ND CHILD: Look out! There are some bats! (*Puts both hands over head*) Why didn't I wear a hat? They'll make nests in my curls!

1ST CHILD: You're crazy. Bats don't make nests in people's hair. (*They spy caldron*) Say, what's that thing? Where are we? This *is* a spooky place!

(*Enter three witches*)

1ST WITCH: Well, well, well. We have some visitors in our witches' hut. Are you thirsty, my dears? We have been making a delicious drink for Hallowe'en. Come right up and have some.

4TH CHILD (*Looks in*): It's all black. And it smells terrible. I don't think I want any.

2ND WITCH: Oh, yes, you do. *Drink* it, or you'll wish you had. (*Laughs. Makes her drink*)

4TH CHILD: Ugh! It tastes like medicine. (*Peers into caldron again*) There's a toad in it! Will I get warts inside me? You get warts on your hands if you pick up a toad.

3RD CHILD: There you go telling a foolish story again. No such thing! I *play* with toads and I never had a wart in my life. Who told you such silly tales? (*Looks in caldron and picks out a cardboard picture of a toad*) Look, Stupid, this is only a picture of a toad. Someone's playing tricks on us!

1ST WITCH (*Takes off mask and laughs naturally*): Hello, everybody! How do you like the surprise? Weren't you scared? I'll bet you never expected to find a witches' hut when you came to the party!

3RD CHILD: It's Janet! You surely did fool us. Who are these witches?

JANET: Oh, Alice and Mary. (*All remove masks, including witches' animals. General hellos*)

2ND CHILD: Gee, I'm glad it's not true. I *was* scared of those bats. Real bats do make nests in your hair, don't they?

ALICE: Of course they don't, silly. They just fly around and eat mosquitoes and other insects.

4TH CHILD: And toads don't give warts?

MARY: No, foolish. The warts have a bad tasting stuff in them to protect the toads from being eaten by their enemies, but they can't give warts to anyone else.

4TH CHILD: Say, what was in that awful stuff you made me drink?

JANET: Oh—lizards' tails and dragons' blood and darning needles and elephants' ears and dead rats and—

4TH CHILD: You're just fooling. What was it really?

JANET: Just a lot of soft drinks mixed up and some salt to make it taste funny and some garlic to make it smell. It won't hurt you.

ALICE: Do you know some people believe these queer stories about the animals? But they are really our good friends. A dragon fly can't sew ears or anything, but it catches lots of insects and so does the toad. And snakes are not slimy. Many of them are very useful. People should not kill these animals.

JANET: That's why we put them in our witches' play for the party. But let's go in the house now. We are going to tell fortunes and bob for apples and have some ice-cream. (*All go off*)

CURTAIN

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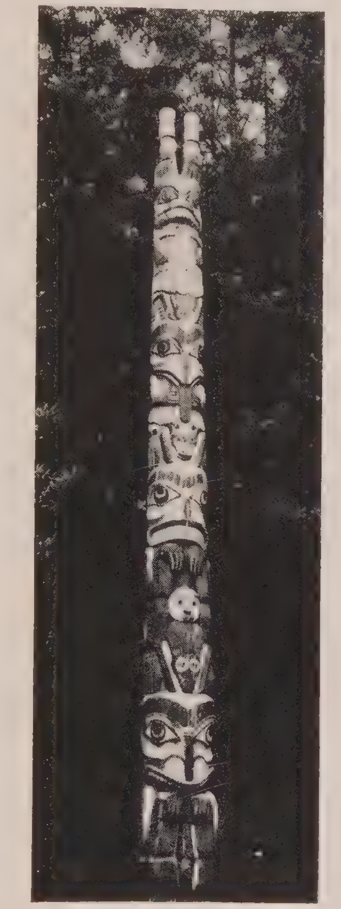
Origin of Primitive Indian Paints Proved

Totem pole restoration by the C.C.C. turns to Nature for tints and pigments

By CHARLES G. BURDICK



HERETOFORE some mystery has surrounded the exact nature and origin of the paints used by the aborigines of Alaska for decorating totem poles, war canoes, and other articles.

The question of use of modern commercial paint, *versus* that used by primitive natives, was brought up in connection with the Totem Pole restoration projects now being carried on in southeastern Alaska by the Civilian Conservation Corps. Since the natives are being employed on this work, and are keenly interested in seeing the poles restored according to ancient Indian customs, it was not difficult to obtain the desired information.

Pigments are obtained from clay and pulverized rocks. Red clay from Revillagigedo Island is used for red coloring, while rocks from Cape Fox and Annette Island provide blue, green, and black.

With the desire to give these pigments a trial, expeditions have been sent out to gather the necessary material. Crushed salmon eggs are used for the binder.

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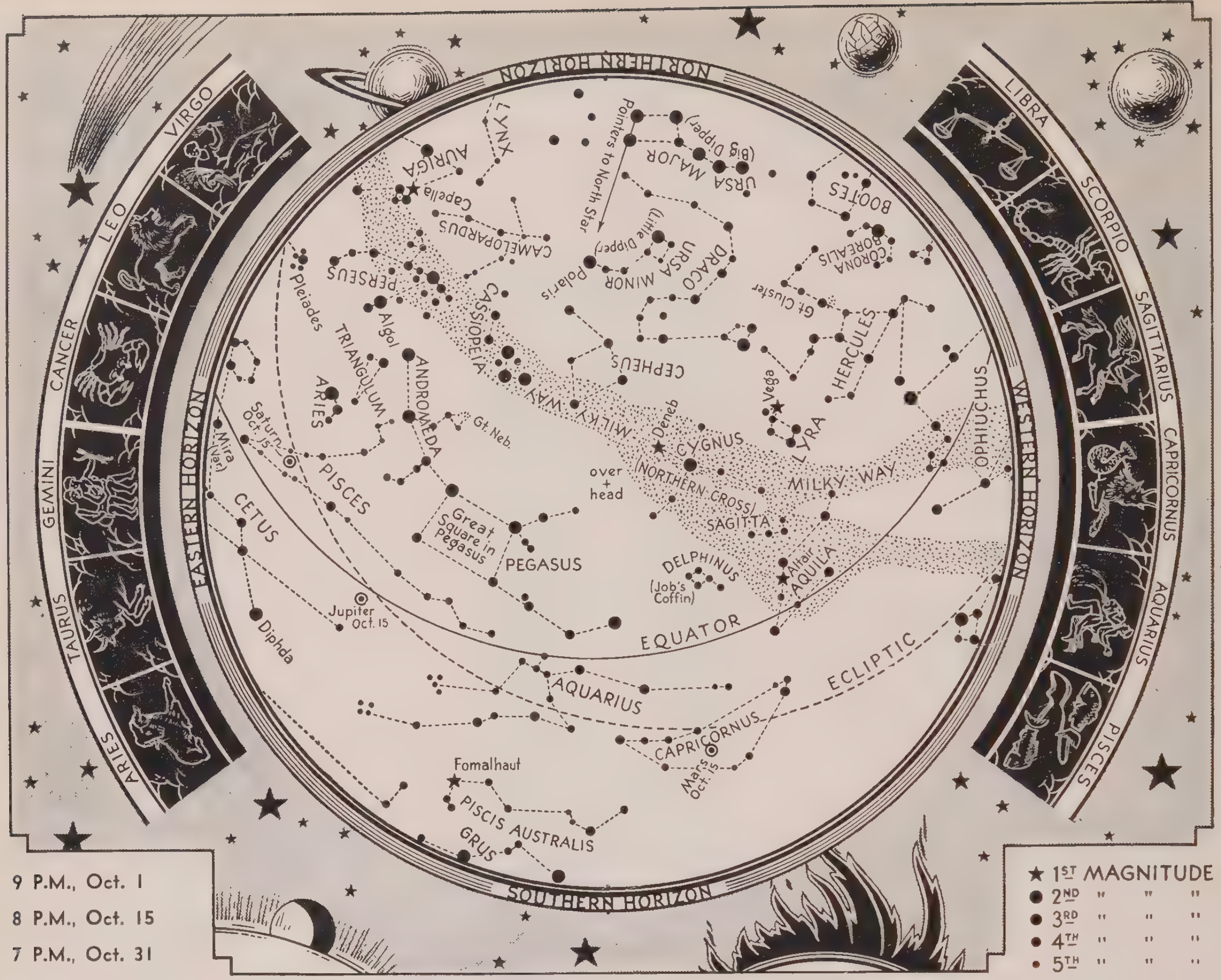
A Catbird Friend

By ELIZABETH B. HARTSHORN

WE CALLED her Mary for no special reason. She was a catbird who became not only a friend but who also brought moments of happiness to one who could not see her. We won Mary's friendship with raisins, for which she would come at our call and repay us with pert poses and serenades.

After eighteen years of perfect eyesight my friend was left blind by a severe illness. It sometimes seemed as though the catbird realized this, for when she flew away she would often touch my friend's cheek with her wing as though in friendly goodbye. Once when my friend was alone on the piazza Mary came and perched on her hand, staying for several moments and singing to her.

One morning Mary brought a youngster with her as though to let it see how it was to feed from human hands. During a severe electrical storm, the catbird perched close to the window as if seeking comfort and company. Wherever we moved our chairs about the lawn Mary would follow. One week of almost steady rain brought the bird to the porch several times, whence she called to us for raisins. When the catbird family was fully grown, mother and children turned from raisins to insects and berries. She had left a happy memory of bird friendliness.


NORTHERN HORIZON
SOUTHERN HORIZON
EASTERN HORIZON
WESTERN HORIZON
VIRGO
LEO
CANCER
GEMINI
TAURUS
ARIES
LIBRA
SCORPIO
SAGITTARIUS
CAPRICORNUS
AQUARIUS
PISCES
LYNX
AURIGA
Capella
CAMELOPARDUS
PERSEUS
Pleiades
Algol
TRIANGULUM
ARIES
CASSIOPEIA
ANDROMEDA
Gt. Neb.
URSA MAJOR
(Big Dipper)
Pointers to North Star
URSA MINOR
(Little Dipper)
Polaris
DRACO
CEPHEUS
BOOTES
CORONA BOREALIS
Gt. Cluster
HERCULES
Vega
LYRA
OPHIUCHUS
MILKY WAY
Deneb
CYGNUS
(NORTHERN CROSS)
over head
SAGITTA
DELPHINUS
(Job's Coffin)
Altair
AQUILA
Saturn Oct. 15
Mira (Var.)
PISCES
CETUS
Great Square in Pegasus
PEGASUS
Jupiter Oct. 15
Diphda
EQUATOR
ECLIPTIC
AQUARIUS
CAPRICORNUS
Mars Oct. 15
Fomalhaut
PISCIS AUSTRALIS
GRUS

9 P.M., Oct. 1
8 P.M., Oct. 15
7 P.M., Oct. 31

★ 1ST MAGNITUDE
● 2ND " "
● 3RD " "
● 4TH " "
• 5TH " "

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

THE ZODIAC

By ISABEL M. LEWIS

Often one will find it helpful in the study of the heavens to keep in mind the fact that the sun, moon, and all of the planets will be found always within a narrow zone, or belt, in the heavens. This is known as the zodiac or "zone of animals", so-named because all of its constellations represent living creatures with the exception of Libra, The Scales, which was formed at a later date from stars belonging to Scorpio.

The zodiac is eighteen degrees wide, extending nine degrees to either side of the ecliptic, or apparent yearly path of the sun through the heavens. It has this width so as to include within it the moon and planets in all parts of their orbits. It has been divided into twelve parts known as the signs of the zodiac, now pictured as decoration with our sky map. Each of these signs is thirty degrees long, so there is one for each month of the year and three to a season. Originally they lay in approximately the same positions as the corresponding constellations whose names they bore. Due to the "Precession of The Equinoxes", however, the signs of the zodiac no longer agree in position with the constellations for which they were named. The first sign of the zodiac, Aries, is the first of the spring signs—Aries, Taurus and Gemini. It occupies the first thirty degrees along the ecliptic eastward from the vernal equinox, which is also known as "The First Point in Aries". Ninety degrees, one fourth of the distance around the ecliptic, are occupied by these three signs. They are followed in turn by the three summer signs—Cancer, Leo and Virgo. The autumn signs next in order are Libra, Scorpio and Sagittarius, and the winter signs, Capricornus, Aquarius and Pisces.

The signs of the zodiac will always be found in exactly the same positions with respect to the vernal equinox. Aries will always occupy the first thirty degrees along the ecliptic counted eastward from the vernal equinox. The position of this point, however, is not stationary in the heavens. It is the point where the celestial equator crosses the ecliptic; also the point where the sun will be found at the beginning of spring when it crosses the equator coming north. Each year this point, known as the vernal equinox, advances along the ecliptic in a westward direction a distance equal to about fifty minutes of arc. As the sun's apparent motion during the year is in the opposite direction, or eastward, it appeared as if the vernal equinox "preceded", or advanced, in the direction of the sun as if to meet it on its return, whence the name "The Precession of the Equinoxes". This is used to denote this motion, shared by the autumnal equinox 180 degrees distant along the ecliptic.

As a result of this "Precession of the Equinoxes", which is caused by the gravitational pull of the sun and moon upon the equatorial bulge of the earth, tending to pull it toward the ecliptic, the vernal equinox makes a complete circuit of the ecliptic in about 26,000 years. On this circuit it passes, in turn, through all the constellations of the zodiac in an east to west direction. At the same time, and due to the same cause, the celestial pole describes, in the same 26,000-year period, a circle 23½ degrees in radius around the pole of the ecliptic. Different bright stars lying along the path of this circle become, in turn, Pole-Stars. About 4600 years ago Alpha Draconis was the Pole-Star, and about 12,000 years from now Vega will become the most magnificent of all Pole-Stars, although some distance farther away from the precessional circle than our own Polaris. Another interesting effect of precession is the change in the apparent positions of the constellations in the heavens. About six thousand years ago the Southern Cross was visible in fifty degrees north latitude as a result of precession. It was about two thousand years ago that the sign of Aries lay in the constellation of Aries, but the westward shift of nearly a minute of arc a year along the ecliptic has moved the vernal equinox into the constellation of Pisces, next to Aries on the west. So it is that when the sun is at the vernal equinox on March 21 it is in the sign of Aries but in the constellation of Pisces. When, at the time of the summer solstice, the sun is farthest north it is in the sign of Cancer, but, in position, among the stars of Gemini. Autumn begins with the sun in the sign of Libra, but actually in the constellation of Virgo. At the beginning of winter, when the sun is farthest south in Sagittarius, it is in the sign of Capricornus.

Each sign of the zodiac has its appropriate symbol, supposed in some way to illustrate the object for which it was named. Although of interest to astrologers, the signs of the zodiac are of little use astronomically and are mentioned chiefly in connection with the beginning of the seasons. It is customary, in giving the date of the beginning of a certain season, to state that the sun is now entering the sign appropriate to that season whatever it may be.

The twelve constellations of the zodiac are useful as a guide in tracing the position of the ecliptic through the heavens, and in indicating the region in which we may expect to find the sun, moon, and planets. Like the Big Dipper a zodiacal constellation is an excellent region of reference for the beginner in locating constellations to be seen in the night sky. There are always at least three zodiacal constellations in view at any one time, while in mid-winter we may see Leo, Cancer, Gemini, Taurus, and Aries extending across the heavens from the eastern to the western horizon.

On October 12 there will be a total eclipse of the sun of 92 seconds' maximum duration. The path of total eclipse will be short and will lie entirely in Antarctic regions. Partial phases of the eclipse will be visible in eastern Australia, New Zealand, the south Pacific and the extreme southern part of South America.

On October 27-28 there will be a large partial eclipse of the moon that will barely miss being total. At the time of greatest eclipse ninety-nine hundredths of the moon's diameter will be covered by the earth's shadow.

The beginning of the eclipse will be visible generally in Europe (except the extreme eastern part), the western part of Africa, the Atlantic Ocean, North and South America, and the eastern part of the Pacific Ocean; the ending will be visible in the North Atlantic Ocean, the Arctic Ocean, North and South America, the Pacific Ocean, the eastern part of Australia, and northeastern Asia. The moon will enter the earth's shadow on October 27 at 11:54 P.M., Eastern Time; the greatest eclipse, .99 in magnitude, will occur at 1:36 A.M., October 28, and the moon will leave the earth's shadow at 3:18 A.M.

The planet Venus has come into the evening sky, but sets shortly after the sun and is not well placed for observation this month. It will be in conjunction with Mercury on October 1, but both planets will be too close to the sun to be seen. Mercury also will be too close to the sun for observation until the end of the month. Mars is still a beautiful and conspicuous object in the evening sky in Capricornus, brighter than any star now visible although by now far surpassed in brilliancy by Jupiter, which is in Pisces and visible most of the night. Saturn will be in opposition to the sun on October 21, and visible all night. It lies to the northeast of Jupiter in Pisces. It is now almost exactly equal to Vega in brightness but is yellowish in color. This is now an excellent time to view the planet and its rings telescopically.

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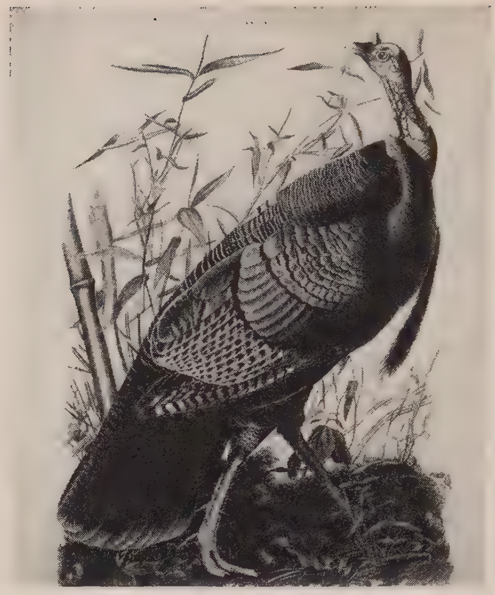
STAR-EXPOSURE

By OSCAR OSTLUND

When night has closed
Its mighty diaphragm;
Hail to Orion and the Golden Ram,
Auriga's jonquil, and the Pleiad host.

The Living John James Audubon

By PAUL H. OEHSER



AUDUBON'S PAINTING OF THE WILD TURKEY—NOW ONE OF THE VANISHING AMERICANS

THE American interest in Nature, which one present-day literary critic has called "an American trait," is nowhere better demonstrated than in the way in which Americans have taken to their hearts one of their greatest birdmen—John James Audubon. Because he was a very human and energetic personality, as well as an artist, a naturalist, a pioneer, a writer, and a strange combination of success and failure, with enough mystery and glamor in his life to perplex and infect those who came after him, he has been a perennial inspiration to many people.

It is not likely that there is now a man alive who ever saw Audubon in the flesh, although the year of his death, 1851, would barely admit such a possibility. Enough time has elapsed for the name of Audubon to become a legend, and it has. Nearly every school-child in our country knows this name before he knows who Audubon was or what he did, just as he knows Washington's, Lincoln's, and even Lindbergh's. And around Audubon a great body of lore and literature is accumulating, out of which is arising an American hero. The reverberations of his genius, after a hundred years or more, seem to be strengthening rather than diminishing. So it may be profitable to review some recent evidences that Audubon still walks the earth.

The definitive life of Audubon is Prof. Francis H. Herrick's *Audubon the Naturalist,* first published in 1917. Last year Professor Herrick brought out a new, one-volume edition of this biography, incorporating new information that had come to light in the 21 years since the work first appeared. At least four other Audubon biographies have been published in recent years: *Audacious Audubon,* by Edward A. Muschamp, in 1929; *Singing in the Wilderness: A Salute to John James Audubon,* by Donald Culross Peattie, in 1935; *Audubon,* by Constance Rourke, in 1936; and *Audubon, An Intimate Life of the American Woodsman,* by Stanley Clisby Arthur, in 1937.

In addition, Mr. Peattie (with Eleanor R. Dobson) has written an eight-column account of Audubon for the recently completed Dictionary of American Biography, and a chapter called "Wilderness Birdmen," on Alexander Wilson and Audubon, for his popular book *Green Laurels: The Lives and Achievements of the Great Naturalists* (1936).

This cumulative interest in the great woodsman reached a high point on November 16, 1937, when the Macmillan Co., New York, republished Audubon's *The Birds of America* in quarto size, reproducing in color not only the 435 illustrations from the original Elephant Folio edition, but also 65 paintings of western birds that Audubon made at a later date. This book is important, not for any especial distinction in the art of bookmaking or color-printing, but because for the first time it made available at a price within the reach of the general public the complete work on which Audubon's fame as a bird-artist rests. Previous editions of *The Birds of America* have long since passed into the realm of rare collectors' items, to be consulted by the ordinary bird student only in libraries.

It was Audubon's lot to have a dramatic, and to us a romantic life; he lived in an age that has been labeled romantic by literary historians—the age of Byron, Scott, Goethe, and our own James Fenimore Cooper, who died in the same year as Audubon; he met hundreds of prominent persons; he traveled as perhaps no other man of his day traveled—the day of frontier America. There was a great deal of the Paul Bunyan in him. And so it is little wonder that his life has inspired many kinds of writers, writers outside of science and ornithology and art.

Those who attended the 1936 annual dinner of the American Ornithologists' Union in Pittsburgh will remember the "Scenes from the Life of Audubon," written by Samuel Scoville, Jr., of Philadelphia, and effectively presented by the drama department of the Carnegie Institute of Technology. Some of Audubon's interesting relationships with Constantine Rafinesque, Charles Lucian Bonaparte, Sir Walter Scott, and Christopher North were portrayed on the stage, and seemed significant to me in suggesting that a full-length play based on the life of Audubon awaits the pen of some American playwright. The material is certainly there, and with the noticeable increase in the number of (Continued on page 474)

Pine Barrens, Home of the Pyxie

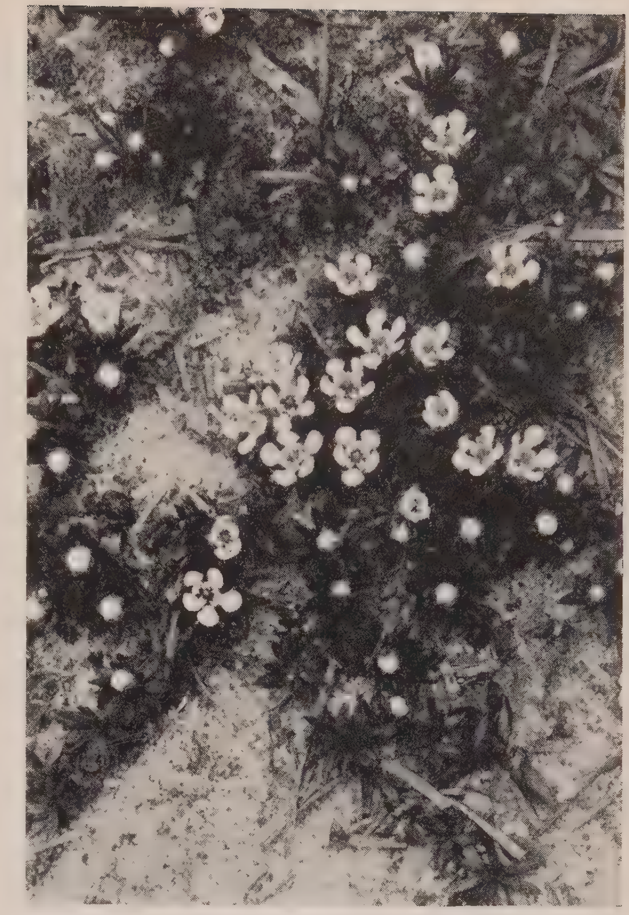
By WARREN C. WILSON

SOUTHEASTERN New Jersey is a remarkable place. In ages past it was covered by the sea; then the dynamic crustal forces of the earth that raise and lower continents pushed the area above sea level. The gently rolling sandy wastes developed a peculiar and characteristic flora that has been, and still is, of much interest to botanists and other plant lovers.

One need not be a scientist to observe the tremendous difference in the manner of growth of familiar plants, and also the host of strange species that inhabit this region, aptly named the Pine Barrens. One generally notices, first, the large number of pines and oaks. They replace the mixed deciduous woods to which most in the East are accustomed. The coffee-colored streams and large sphagnum bogs, with their tangle of plants, also attract attention. In the heart of the Barrens I was surprised to find mature forests hardly higher than my waist. This stunted growth is one of the many unusual features of the region.

A person unacquainted with the Barrens often exclaims over the soil, which is mostly grayish-white sand on the surface with yellowish gravel beneath. The explanation of the stunted growth of plants in parts of the region lies mainly in this soil, according to a common theory devised to explain the existing conditions. The extreme porosity of the ground allows a great amount of leaching by rain water. The quartz sand decomposes so slowly that it does not replenish the minerals that have been washed away. Most plants need these mineral nutrients in ample quantities to produce normal growth. Another, and probably equally important factor, is the high acidity of the soil. This, too, is a result of the leaching; the lime, which keeps a soil neutral or alkaline, has been largely carried away in the drainage water and the soil becomes acid. During the summer the sand dries out easily and the plants must exist on a meager supply of water. Even after a heavy thunder shower one can go about without fear of muddy feet, because the water disappears into the ground almost as fast as it falls. The winters are mild with little snow and the summer temperatures are high.

Since plants, just as persons, show a marked reaction to their environment, it is not surprising that many species cannot tolerate the combination of conditions set up in the greater part of the Pine Barrens area. The climate alone is the controlling influence where boggy conditions prevail. These various factors cause an automatic selection of the kinds of plants that grow in the Barrens. Some of our common plants have not adapted themselves to these unusual circumstances and do not occur there; others grow in the Barrens but are changed in appearance. A third group, which comprises the typical Barrens plants, apparently needs these conditions, for they are restricted to this and similar regions. In the struggle for existence they have won out and forced the plants not so well suited to this particular environment to more congenial habitats.



PYXIE OF THE PINE BARRENS
This interesting wild flower has found survival in a soil that is primarily quartz sand

The pyxie, also called flowering moss and pine barrens beauty, and, by the botanists, *Pyxidanthera barbulata,* is one of the plants that belongs in this third group, being abundant in the Barrens and other places of the same type but not found elsewhere. The pyxie belongs to the family Diapensiaceae, and was named by Michaux early in the nineteenth century. Its range extends from New Jersey to North Carolina. This plant forms mats about half an inch high—commonly a foot or two in diameter—and has centrally-located roots. The tiny leaves are usually a shiny bright green; in very dry, sunny places they often turn reddish. In the fall many of the plants take on a deep, bronzy-red hue. The profuse white, or sometimes pink, flowers are borne close to the mats. They open in late March, if the season is early, or in April.

Gardeners often dig plants of the pyxie in the Pine Barrens and attempt to move them to their gardens. They rarely succeed in transplanting them; usually the greater part of the roots are left behind and the plants are set out in uncongenial surroundings. I have found that a very small plant, if dug carefully and kept moist, will sometimes grow and bloom when placed in a sandy soil and light shade in the garden. However, nursery plants are less likely to die and are more vigorous.

THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Rock and Mineral Keys

The special educational insert in this issue of Nature Magazine deals with rocks and minerals. These may be studied individually or comparatively, but they lend themselves easily to the use of keys, and this page is therefore devoted to a key to some of the rocks and minerals considered in the insert.

Rocks, of course, are solid parts of the earth's crust composed of one or more *minerals.* In winter, ice firmly in contact with the earth is a rock composed of the mineral, water.

To identify some of the commoner rocks or minerals decide first whether you are dealing with a rock or mineral; then consult the appropriate key. Read what is given under the first unit and decide which of the two tests most nearly fits the specimen in hand. Then move on to the next number in the key. Continue this process until the name of a rock or mineral is given.

In most cases the rocks or minerals mentioned in the key are also considered in the charts in the insert in the center of this issue of the magazine. Consult these to learn further of the sample being studied. Then, if everything seems to agree, you may be reasonably sure that you have identified the rock or mineral in hand. One cannot always be certain with rocks and minerals because the rocks, at least, have many intermediate forms. Nor can one be dogmatic in the charts dealing with other forms of Nature.

Hilliard Firschein of Brooklyn, for example, using an earlier chart, decided that a pet turtle was a male because the chart said that the male had red eyes. The turtle laid eggs, so something plainly was wrong. The character of red eyes for the male turtle is a secondary sexual character and generally holds in sex determination. Male humans often have effeminate voices, and female humans sometimes have coarse hair on their faces, and yet one would ordinarily say that male humans have deep-toned voices and female humans have smooth faces. The material in these charts and in these keys must of necessity use the characters that are most distinctive, but don't expect them to fit exactly every situation. Nature is too complex for all of its secrets to be exposed in articles such as these.

A Key to a Few Common Rocks

1. Will effervesce (bubble) if drops of hot or cold hydrochloric acid are placed on it. Read 2.

Will not effervesce when drops of hot or cold hydrochloric acid are placed on it. Read 7.

2. Crystalline. *Marble.*

Not crystalline. Feels smooth. Read 3.

3. Will effervesce only if hot hydrochloric acid is placed on it. *Dolomitic Limestone.*

Will effervesce with cold hydrochloric acid. Read 4. *Limestone.*

4. Composed of rather loosely consolidated shells and shell fragments. *Coquina* (coarse shells). *Chalk* (fine shells).

Not obviously composed of shells, but made of lime and sand or clay. Read 5.

5. Of lime and possibly 15 percent sand, with some clay. *Hydraulic Limestone.*

Fine-grained, without obvious sand mixture. Read 6.

6. Especially fine-grained and compact; resonant when struck. *Lithographic Limestone.*

Not necessarily compact but obviously deposited by precipitation. White or colored. *Travertine.* If banded and dense. *Onyx.*

7. Has the odor of clay when moist or breathed upon; smells earthy. Read 8.

Does not have the odor of clay when moist or breathed upon. Read 12.

8. Breaks into chips or flakes; composed of fine particles. *Shale.* Read 9.

Like above but breaks into thin, brittle sheets or plates and shows a white mark when scratched. *Slate* (metamorphosed shale).

9. Obviously with impurity of sand. *Arenaceous Shale.*

Without obvious sand impurity. Read 10.

10. Usually black because of organic matter. *Bituminous Shale.*

Not black ordinarily. Read 11.

11. With some lime impurity. *Calcareous Shale.*

With some iron impurity. *Ferruginous Shale.*

Mostly clay. *Argillaceous Shale.*

12. Rock mass splits into leaves or fine crumbling particles and a mixture of minerals visible to the naked eye. Read 13.

Rock mass does not split as suggested above. Read 14.

13. Banded, crystalline, with feldspar visible to the naked eye. Inclined to split better in one direction than in others. *Gneiss.*

Material arranged in layers with feldspar not visible to the naked eye. Coarser schists grade into gneisses. Finer schists grade into slates. *Schist.*

14. Individual grains can be determined with naked eye or with hand lens. Read 15.

Individual grains too small to be recognized as such by hand lens. Read 20.

15. Individual grains uniform in size and composition. Read 16.

Individual grains not uniform in size or composition. Read 17.

16. Soft enough to crumble with the fingernail; feels rough and gritty; composed of cemented coarse or fine sand. When broken does not break in flakes across the sand grains. *Sandstone.*

Harder than above; glassy; sand cemented with quartz; may show flaky edges across sand particles when broken. *Quartzite.*

17. Made up of crystals of different minerals such as mica, quartz, feldspar, hornblende, the size of the individual crystals being small. Read 18.

Composed obviously of fragments of other rocks cemented with finer material. Read 20.

18. Quartz present. *Granite.*

Quartz absent. Read 19.

19. Light colored. *Syenite.*

Dark colored. *Diorite.*

20. Fragments rounded as though water-worn. *Conglomerate.*

Fragments angular. *Breccia.*

21. Rock with small and numerous pores usually light in weight and color. *Pumice.*

Rock without small pores. Black or dark in color. Read 22.

22. Glassy. *Obsidian.*

Not glassy. *Basalt.*

A Key to Some Common Minerals

1. May be scratched with the fingernail. (Softer than 2¼.) Read 2.

Cannot be scratched with the fingernail. (Harder than 2¼.) Read 9.

2. Color black or very dark. Read 3.

Not black. Read 4.

3. Splits into elastic sheets; does not make mark on paper. *Biotite.*

Does not split into elastic sheets; very soft; soils fingers; marks paper with black. *Graphite.*

4. Splits into thin, flat, transparent or translucent sheets. *Muscovite.*

Does not split into thin flat sheets or scales. Read 5.

5. Clay-like mass; generally white though may be discolored; has odor of clay when breathed on; sticks to dry tongue. *Kaolin.*

Not clay-like. Read 6.

6. Large crystals or granular crystalline. May be dissolved in water; has salty taste. *Halite* (salt).

Not of large crystals. Read 7.

7. Color greenish to white. Read 8.

Color not greenish; may be transparent. *Gypsum, Selenite.*

8. Has a greasy feel; will mark on cloth. *Talc.*

Lacks a greasy feel; mica-like, but plates not elastic. *Chlorite.*

9. May be scratched with a cent. (Softer than 3.) Read 10.

Cannot be scratched with a cent. (Harder than 3.) Read 14.

10. Color white or colorless; may be tinted red, blue, green or other colors; effervesces in cold hydrochloric acid. *Calcite.*

Color not white, nor colorless; does not effervesce with cold hydrochloric acid. Read 11.

11. Color lead-gray. Crystals, cubic. *Galena.* Lead ore.

Color not lead-gray. Read 12.

12. Color copper red; an irregular mass, scales or twisted wire-like materials. *Copper.*

Color not copper red. Read 13.

13. Has greasy feel; color greenish. *Serpentine.*

Does not have a greasy feel; effervesces in hot hydrochloric acid. *Dolomite.*

14. May be scratched with a knife. (Softer than 5.5) Read 15.

May not be scratched with knife except with great difficulty. Read 19.

15. Crystalline. Read 16.

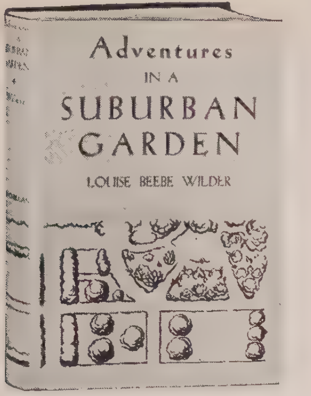
Not crystalline. Color dark brown to nearly black; sometimes of a metallic luster; shows a yellow streak on porcelain. *Limonite.*

16. Of a metallic luster. Read 17.

Not of a metallic luster; colorless, white or tinged with blue, yellow or other colors. Read 18.

(Continued on page 476)

Your Garden Bookshelf



ADVENTURES IN A SUBURBAN GARDEN

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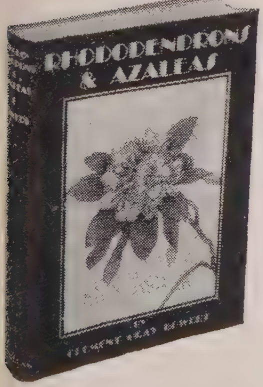
RHODODENDRONS AND AZALEAS

By Clement G. Bowers



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TIPS ON TULIPS

(Continued from page 439)

and the stamina of Darwins are responsible for a race that bears flowers almost as large as the May-flowering type, blooming two to three weeks earlier than that. Thus Triumphs bridge the gap between the early- and late-blooming types, giving the gardener uninterrupted continuity for his color carnival.

Pink Beauty and La Remarkable had one characteristic in common—their petals had contrasty edges. This characteristic proved hereditary, and greatly enhanced the beauty of many varieties of the class—providing you like contrasts. In our own border, President von Hindenburg never failed to evoke keenest admiration from garden visitors. Imagine a flower as large as any Darwin, of garnet-red leaning toward purple, dressed with a golden-yellow edge, and you have about the showiest object imaginable.

Aviateur is of shimmering carmine-red, with a white edge; Denbola offers a dark amaranth-red piped with a creamy white. But the straight salmon-rose of Johanna, and reddish-violet of Telescopium are just as impressive. There really is a Triumph tulip for every taste and fancy.

The time to plant them is from early October until frozen soil puts an end to gardening. I have planted them four inches deep, five to six inches apart, as late as the day before Christmas, and they bloomed in May—just as they did at the World's Fair.

INDOORS AND OUT

(Continued from page 423)

island of Skokolm in October, 1927, brought his bride there the following July, and lived on the island long enough to demonstrate the possibilities of such a life. His book describes this life and his many excursions to other islands. With all its interest that I call "romantic" for want of a better word, this is a solid book, describing each island and its human and wild inhabitants, illustrating them with fifteen excellent black and white maps and documenting the observations with forty-nine examples of the author's understanding of the art and usefulness of photographs.

Lockley's ornithological work has now been so highly recognized that the "procession of visitors has had to be organized," and "as a result Skokolm has now the tag 'Bird Observatory' attached to it." His way of living, however, has been modified: "Ann had now to go to school."

"So it has come to this—that we winter on the coast opposite the island. Like the guillemots, we pay it day-visits in midwinter; like the puffins, we return to live on it at the end of March; and, like the storm-petrels, we temporarily abandon it in October."

John Burroughs

The John Burroughs Association wishes to get in touch with all organizations anywhere that have been organized to honor the Sage of Slabsides. The purpose is to discover whether there is interest in a yearly publication containing reports of these various groups and articles about John Burroughs. Write to Dr. Clyde Fisher, American Museum of Natural History, 77th Street and Central Park West, New York City.

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GROW PLANTS

NATURE IN PRINT

As a convenience to readers the books reviewed in this department of Nature Magazine may be ordered through the book department of the American Nature Association.

Great Animal Stories

In three splendid volumes Frances E. Clarke has compiled collections of great stories of dogs, cats and horses, stories that will live and be read and reread. She has now rounded out this collection of books with a compilation of great wild animal stories of our day, and has titled the book *Wild Animals.* Among the authors included are William Beebe, Courtney Ryley Cooper, James Oliver Curwood, Hal G. Evarts, Grey Owl, Edward A. Preble, Archibald Rutledge, Herbert Ravenel Sass, Samuel Scoville, Jr., and, last but by no means least, the late Dallas Lore Sharp. Through this volume runs a strong thread of wildlife conservation. Miss Clarke has chosen stories that reflect a deep understanding of the world of the wild. As with her previous books, she has read widely and chosen carefully to give us a book of outstanding permanent value. We are happy to note that four of the selections first made their bow in the pages of NATURE MAGAZINE. As with its companion volumes, this book is published by Macmillan at $2.50.

Indian Legend

Marion E. Gridley is the wife of Chief Whirling Thunder of the Winnebagos, and for sixteen years has been secretary of the Indian Council Fire, a national organization devoted to Indian interest and Indian welfare. She is, therefore, outstandingly equipped to write *Indian Legends of American Scenes,* and thus to preserve legends of many tribes. The book is divided into chapters devoted to the Indians of many sections of the country, and each group of legends is preceded by a brief picture of the history of the Indians of these sections. Fascinating reading, the book also has notable historical value. It is illustrated by eleven color plates and a number of black and white drawings. Published by M. A. Donohue and Company, it sells for one dollar.

The Book of Turtles

Filling a place not hitherto adequately filled, *Turtles of the United States and Canada* by Clifford H. Pope will be hailed by everyone interested in turtles. This book is, in fact, the only complete treatment of American turtles. It is popular and interesting in text, and will serve the layman as well as the more advanced student for identification and as a source of information on character, life habits and distribution. The text, which begins with a general discussion of turtles, is supplemented by ninety-nine fine photographs that splendidly aid in identification. Dr. Pope was for ten years the assistant Curator of Herpetology at the American Museum of Natural History, and is the author of a standard study of the reptiles of China, having spent five years as field naturalist in China with Dr. Roy Chapman Andrews. The book is published by Alfred A. Knopf and the price is $3.75.

Plants Without Soil

Visitors to the New York World's Fair have seen in the Heinz Building and the Westinghouse Building interesting demonstrations of hydroponics, or the growth of plants without soil. Elsewhere in this greatest of world's fairs they have seen suggestions of the world of tomorrow in which such methods of production are to play a part. This reflects the growing interest in this subject, about which a popular literature is gradually being built up. A recent addition to books on this subject is *Growing Plants without Soil* by D. R. Matlin. This text is subtitled "The A.B.C. of Plant Chemiculture" and is valuable to anyone experimenting in this field. The book is published by the Chemical Publishing Company, 148 Lafayette Street, New York City, at two dollars.

A Unique Garden

Charles F. Barber of Oregon has a unique garden with many notable specimen plants. He is interested in the development of new plants and in growing existing forms to their fullest possibilities. But, beyond that, Mr. Barber feels that his success with plants derives from an understanding of them that is almost spiritual; that he enters his garden through a "secret gate" that opens up to him opportunities not vouchsafed most of us. His views and his garden are described in *Our Garden,* an interesting although sometimes elusive little book. The publishers are Binfords and Mort, 102 N. W. Ninth Avenue, Portland, Oregon, and the price is $1.50.

About Small Animals

Written entertainingly and with a background of a thorough knowledge of the subject, Robert Snedigar's *Our Small Native Animals, Their Habits and Care* is a worth-while book. We trust that it will not inspire too many youthful collections and backyard zoos, since our wildlife resources in many sections, so far as some species are concerned, can ill afford further inroads. The chief value of the book, to us, lies in the discussion of life habits, and in the proper care of wild pets when those pets may justifiably be kept in captivity. It should have one salutary effect in informing young zoo curators how to keep their charges in a state of relative comfort and health. Published by Random House, this book sells for $2.50.

Animals in Winter

The latest addition to the fine collection of field books published by Putnam is entitled *Field Book of Animals in Winter* and is the work of Ann H. Morgan. Following the general style of its companion volumes, and like them in size, this book is devoted to insect, reptile, bird, mammal and other forms and their winter activity or lack of activity. The author is professor of zoology at Mount Holyoke College. This is an invaluable book for Nature students and graphically shows what may be observed and learned during the northern winter months. The price is $3.50.

Mathematics

The mathematically-minded Nature enthusiast will find provocative ideas in a little book entitled *Fabre and Mathematics,* a collection of essays by Lao Genevra Simons, published by Scripta Mathematica, Yeshiva College, Amsterdam Avenue and 186th Street, New York City. The price is one dollar.

FOR BIRD LOVERS

The Library Committee of the Audubon Society of the District of Columbia has compiled a splendid list of recently published bird books and has kindly extended to us permission to pass this list on. Copies of these books may be purchased through your local dealer, from the publishers, or through the Book Department of the American Nature Association. The complete list is:

Batchelder, Charles Foster. AN ACCOUNT OF THE NUTTALL ORNITHOLOGICAL CLUB. Memoirs Nuttall Ornith. Club No. 8, 109 pp., illus., 1936.

Beebe, William. THE LOG OF THE SUN: A CHRONICLE OF NATURE'S YEAR. 8 vo., cloth, 321 pp., N. Y. Holt, 1938, $2.50.

Bennett, Logan J. THE BLUE-WINGED TEAL. 8 vo., cloth, 160 pp., illus., Ames, Iowa. Collegiate Press, Iowa State College, 1938, $1.50.

Bent, Arthur Cleveland. LIFE HISTORIES OF NORTH AMERICAN BIRDS OF PREY. (Part 2). 8 vo., paper, 482 pp., illus., U. S. Nat. Mus. Bull. No. 170, Washington, D. C. Smithsonian Institution, 1938, 60 cents.

Burroughs, John. SONGS OF NATURE. 12 mo., cloth, 359 pp., N. Y. Garden City Pub. Co., 1938, $1.19.

Canby, Henry Seidel, ed. THE WORKS OF HENRY DAVID THOREAU. 8 vo., cloth, 848 pp., 11 reproductions of photographs by Henry B. Kane. Boston, Houghton Mifflin, 1937, $5.00.

Chapman, Frank M. LIFE IN AN AIR CASTLE. 8 vo., cloth, 250 pp., illus., N. Y., Appleton-Century, 1938, $3.00.

Commons, Marie Andrews. THE LOG OF TANAGER HILL. 12 mo., cloth, 261 pp., illus., map in pocket. Baltimore, Md., William and Wilkins, 1938, $2.50.

Darling, F. Fraser. BIRD FLOCKS AND THE BREEDING CYCLE. 12 mo., cloth, 124 pp., N. Y. Macmillan, 1938, $1.75.

Halle, Louis J. BIRDS AGAINST MEN. 12 mo., cloth, 228 pp., N. Y., Viking Press, 1938, $2.50.

Herrick, Francis Hobart. AUDUBON THE NATURALIST. 2nd ed., two vols. in one. 8 vo., cloth, 951 pp., illus., N. Y., Appleton-Century. 1938, $6.00.

Hoffman, Ralph. BIRDS OF THE PACIFIC STATES. 12 mo., cloth, 353 pp., illus., 10 col. plates. Boston, Houghton Mifflin. 1938, $3.50. (Reprint 1927 ed.)

(Continued on page 474)

THE ASSOCIATION'S BOOK SHELF

From the many hundred bird books published it is difficult to select a bird lovers' library. The following bird books, however, are recommended by the American Nature Association and will serve as an excellent foundation for such a library. Order direct from your Association.

BIRDS OF AMERICA..$3.95

By T. Gilbert Pearson, John Burroughs, Edward H. Forbush and others

The most comprehensive, most beautifully illustrated encyclopedia of American Bird Life ever published. Now complete in one mammoth volume, size 8¼ x 11¼ x 1¾ inches. Beautifully bound in genuine green Fabricoid stamped with gold title and decorations on backstrap, doubly reinforced for long hard usage. Contains more than 1,000 pictures, more than 1,000 birds, more than 1,000 pages. A fascinating treasure house of knowledge for nature lovers of all ages everywhere.

A GATHERING OF BIRDS..................................$3.00

By Donald Culross Peattie

A book every bird lover has been waiting for—the best that has been written about birds by the great ornithologists of the last 150 years, included in a single volume. 379 pages.

BIRD COMPANIONS...$3.00

By Angelia Kumlein Main

One of the most original and interesting of all recent contributions to popular bird lore. It is very evident that the author has not only been a lover of birds from early childhood but was literally brought up in intimate companionship with them and therefore has enjoyed unusual opportunities for learning of their ways. 40 illustrations, many in colors. Blue cloth stamped in gold, jacket in colors.

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FOR BIRD LOVERS

(Continued from page 472)

Kantor, MacKinlay. THE NOISE OF THEIR WINGS. (Fiction) 12 mo., cloth, 240 pp., N. Y., Coward-McCann. 1938, $2.50.

Kirkman, F. B. BIRD BEHAVIOUR. 8 vo., cloth, 232 pp., illus., N. Y. and London, Nelson, 1938, 7 shillings 6 pence.

Oberholser, Harry C. BIRD LIFE OF LOUISIANA. 8 vo., paper, 834 pp., illus. col. pl., New Orleans, La., Dept. of Conservation, 1938, $1.00.

Priestley, Mary. A BOOK OF BIRDS. 12 mo., cloth, 384 pp., 82 wood engravings by C. F. Tunnicliffe, N. Y., Macmillan, 1938, $2.50.

Ritter, William Emerson. THE CALIFORNIA WOODPECKER AND I: A STUDY IN COMPARATIVE ZOOLOGY. 8 vo., cloth, 340 pp., col. illus., Berkeley, Calif., Univ. of Calif. Press, 1938, $3.50.

Roberts, Thomas S. LOGBOOK OF MINNESOTA BIRD LIFE, 1917-1937. 8 vo., cloth, 355 pp., 21 line drawings and frontispiece etching by Walter J. Breckenridge, Minneapolis, Minn., Univ. of Minn. Press Ltd., 1938, $3.50. Ed. limited to 500 copies, only 400 for sale.

Robertson, A. W. P. and Powell, R. D. BIRD WATCHING DAYS. 8 vo., cloth, 252 pp., 32 photos by author, N. Y., Collins, 1938, $2.50.

Ross, William Graham. BIRD NOTES FROM THE JOURNAL OF A NATURE LOVER. Ed. by Ella L. Clark. 12 mo., cloth, 169 pp., map, Chicago, Ill., W. B. Conkey Co., 1938.

Sprunt, Alexander. BEAUTIFUL BIRDS OF SOUTHERN AUDUBON SANCTUARIES. Illus., N. Y., Nat. Asso., Audubon Soc., 1938, $1.00.

Stephens, T. C. SUMMER BIRDS OF LAKE OKOBOJI REGION OF IOWA. 8 vo., paper, 63 pp., Univ. of Iowa Studies, n. s. 348, Studies in Nat. Hist., v. 17, no. 7, Iowa City, Iowa, St. Univ. of Iowa, 1938, 35 cents.

Stevenson, James O., et al. CHECK-LIST OF THE BIRDS OF THE U. S. NATIONAL PARKS. 4 to., 400 pp., mimeographed. Washington, D. C., U. S. National Park Service, 1938. Free.

Taverner, Percy Algernon. BIRDS OF CANADA. 8 vo., cloth, 445 pp., 661 illus., 173 col. pl., Philadelphia, Pa., McKay, 1938, $4.00.

Van Dersal, William. NATIVE WOODY PLANTS OF THE UNITED STATES, THEIR EROSION-CONTROL AND WILD-LIFE VALUE. 8 vo., cloth, 362 pp., 44 illus., maps. U.S.D.A. Misc. Pub. 303. Washington, D. C., Gov. Print. Office, 1938. $1.75. (Bird stomach records and observations on bird feeding habits, pp. 35-292.)

Van Tyne, J. and Sutton, George Miksch. BIRDS OF BREWSTER COUNTY, TEXAS. 8 vo., paper, 119 pp., illus., map. Univ. of Mich. Mus. of Zool. misc. pub. 37, Ann Arbor, Mich., Univ. of Mich. Press, 1938, $1.25.

Verrill, A. Hyatt. STRANGE BIRDS AND THEIR STORIES. 8 vo., cloth, 203 pp., illus., col. pl., Boston. Page, 1938, $2.50.

White, Francis B. LOCAL NOTES ON THE BIRDS AT CONCORD, NEW HAMPSHIRE. 8 vo., 126 pp., map. Concord, N. H., Rumford Press.

Wolfe, Linnie Marsh. JOHN OF THE MOUNTAINS: UNPUBLISHED JOURNALS, 1869-1911, OF JOHN MUIR. 8 vo., cloth, 459 pp., 9 illus. from photos, Boston, Mass., Houghton Mifflin, 1938, $4.50.

THE LIVING JOHN JAMES AUDUBON

(Continued from page 468)

biographical and historical plays at the present time I venture to predict that it will not be many years until Audubon has his play.

Even poets have not escaped the Audubon magnetism. Rosemary and Stephen Benét, for example, have included, in their *A Book of Americans,* a charming poem for children, beginning

> "Some men live for warlike deeds,
> Some for women's words.
> John James Audubon
> Lived to look at birds"

and going on to tell his whole life story in nine vivid and sprightly stanzas. In September, 1936, in *The American Mercury,* Amanda Benjamin Hall published a poem entitled "Salute to Audubon"; and in the Spring, 1937, number of *The North American Review* the poet Thomas Caldecot Chubb had an article on Audubon titled "The Birds of North America." Another poetic tribute appeared in the February, 1937, issue of *Poetry: A Magazine of Verse;* it is an imaginative sequence by the New England poet John Peale Bishop called "Homage to Audubon," in four parts: "Conquest of the Wind," "Fourteen," "The Silence of the Sideboard," and "Les Balcons Qui Rêvent." Mr. Bishop is a writer of national reputation, and his selection of the Audubon theme is significant as another step in the assimilation of the Audubon legend into our national literary tradition.

In the field of the essay, you may find a delightful piece on Audubon by my friend Howard Zahniser in his "Indoors and Out" page in the April, 1939, issue of NATURE MAGAZINE.

I have by no means mentioned all the Audubon items that have recently appeared. Someone, of course, will come along in a few years and "debunk" Audubon, a thing that will probably need doing more or less periodically in order to keep fact and fiction from being hopelessly commingled. In a measure this has already been done by Professor Herrick in the new edition of his *Audubon the Naturalist,* and by Mr. Arthur in his biography, both of whom deal, with discredit, with the theory seriously offered by some that Audubon was none other than the famous Lost Dauphin of France, the son of Louis XVI.

As a writer, Audubon's reputation is not great. He will not go down in history as a master of English, although his journals and letters, particularly those to his intimate friends, are written with great gusto and frankness, although deficient in some respects. We must remember, however, that Audubon lived at a time when American writing was at a low ebb, and that his writing was probably above average. Audubon's contribution to American literature will be a passive one, arising from the fact that his life story is a reservoir of inspiration for others that will be pervasive and lasting. In his art, and in his science, too, there is that same kind of infectious impetus; they are not perfect, but they have been and will continue to be immeasurably great in their influence.

Not long ago there was opened to the public a new Audubon memorial—the Audubon Museum in Audubon Memorial Park in Henderson, Kentucky, the town where the young artist once lived and worked. The building's first floor has a gallery for Audubon prints, a Kentucky room containing pioneer material, and a room for the use of the society known as the Transylvanians. On the second floor is space for exhibits of mounted birds, books, and Audubon memorabilia. The structure is of native stone, much of it quarried in the park; it is of Norman design and includes a round bird tower with pigeon holes in the masonry. The memorial is a joint project, sponsored by the Audubon Society of Henderson, the State of Kentucky, the City of Henderson, the Transylvanians, and the Henderson Historical Society. It is probably the newest and one of the most impressive tributes to the memory of John James Audubon; it is in the same class with the far-flung Audubon societies, the Audubon Nature camps, Audubon Park in New York City, the Audubon statue in the Hall of Fame, and other memorials that have taken a concrete form. But all these in the end will be but roadside markers of the real tribute of America to Audubon—the transcendence, less than a hundred years after his death, of his name and nature in our culture and inheritance.

Generous Waxwings

"We were driving slowly through a cemetery," writes Elizabeth D. Morgan of Toledo, Ohio, "when we noticed ahead of us a flock of cedar waxwings flying from a tamarack tree to the ground and up again. Just below the tree one of the water faucets was dripping into a cluster of old oak leaves. The hollowed leaves held the water like a cup. From this the birds were drinking in turn. There must have been twelve or fifteen birds in line, and as each took a sip, he either flew up into the tree above, or slipped quietly to the end of the line and waited his turn again. It was this lining up for a second or third drink that seems to me to prove that the waxwing is naturally generous. There was no crowding, almost no sound, but a quiet, happy sharing of the water that was delightful to see. The whole scene had an air of unreality. The birds were so silky, so quiet, so undisturbed by their audience, and yet so cheerful in their manner and so confiding as they sat in the branches or took their little drinks, that we have never forgotten the picture, and often speak of it. The group on the ground was only a part of the flock. The larger group in the tree seemed perfectly contented to wait until their companions had satisfied their thirst, and then the whole company took wing together."

Trade Reptiles?

Loren Stern of 4450 North Kimball Avenue, Chicago, Illinois, is an amateur herpetologist and would like to correspond and exchange specimens with others having a similar interest. G. A. Bishop, Route 2, Holt, Mo., also would like to be included.

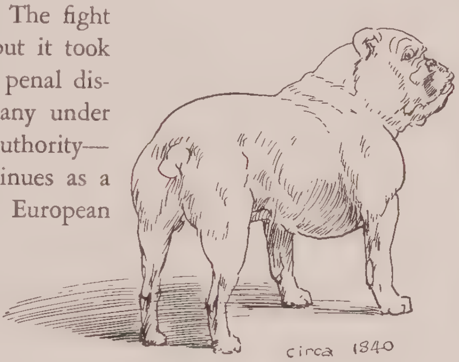
Diana Thorne's DOG COLUMN

THE BULLDOG
Then and Now

BULL and bear baiting, practiced in England, as in the rest of Europe, since the Dark Ages carried part of the miseries of that darkness into the last century and up till the middle of it. Then the light dawned on the British people, and the bulldog, as well as the wretched bull, were released from their activities for such popular diversion.

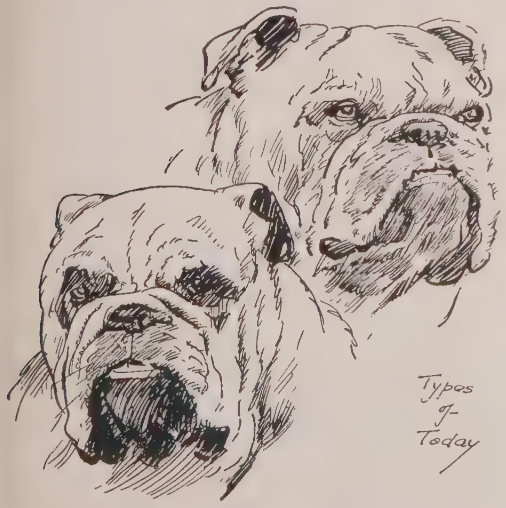
At about the same period the S.P.C.A. had its inception in a very small group of people keenly sensitive to the prevailing indifference toward cruelty to animals. The fight for decency in that respect began; but it took fifty years of heroic effort backed by penal discipline before shocking cruelties—many under the aquiescence of governmental authority—ceased. Even today fox-hunting continues as a social privilege; and in the southern European countries the S.P.C.A. still battles to gain a foothold.

The bulldog today has shed the black mantle of his earlier repute and emerges, not as a baiter and fighter, but as one of the most gentle and lovable of characters.


circa 1840

In my childhood the opening line of a hymn from the pen of the redoubtable Dr. Watts, respected by our grandparents, ran—"Dogs delight to bark and bite". As a child, suspecting but not daring (without further experience) to question the wisdom of my elders, I wondered whether Dr. Watts should be taken seriously. The years as they passed proved the inherent rightness of my scepticism. Dogs—all dogs—desire, as much as the more sane among humans a peaceful and a gentle life. I often doubt whether the most feral of the carnivorous mammalia would not prefer to obtain their sustenance by other means than by hunting and killing. Certainly, in all but a few exceptional cases, the urge to hunt and kill is not founded on a desire to hurt but on the vital necessity for self-preservation. One cannot say as much for man.

The bulldog is a symbol. He is as much emblematic of Britain as is the rose or the lion. Like many a human, he had much to live down in his family history. He has now come into his own with a halo of gentleness, staunchness and sweetness of disposition, characteristics obscured in the past. These qualities make him, considering his other admirable qualities, an ideal pet for man, for woman, for a household of children, or as the guardian of a baby. No kidnapper would have a moment's chance with a bulldog around unless the dog were killed first.


Types of Today

A couple of centuries ago it is probable that in form he was more like the bull-terrier, so far as can be discovered by reference to the written descriptions.

(Continued on page 476)

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THE BULLDOG

(Continued from page 475)

It is only within the last hundred years that the graphic depiction of animals developed to a point of anatomical accuracy. A reference to the paintings of racehorses a hundred years ago and a comparison of these with what is done by present-day painters, like Munnings, will illustrate the point.

In courage the bull dog has no superior. Stonehenge and all other writers on the dogs and on sport of bygone days generally describe him as "the most courageous animal in all creation". That is, quite possibly, not a colorful exaggeration.

The Springer Spaniel

Treating with the breed from every point of view, *The Springer Spaniel* by Maxwell Riddle is a fine addition to the dog lover's library. The author is a breeder, judge and journalist with a thorough knowledge of this dog, the care and training of which are items of importance to every owner. The book is published by the Judy Publishing Company, Chicago, at two dollars.

About the Boxer

This is not a book on fisticuffs but about one of the most interesting of dog breeds, the Boxer. It is, in fact, the first thorough discussion of this breed and represents long research. This dog is not widely known or appreciated in the United States, due to the dearth of knowledge about it. John P. Wagner has remedied this in *The Boxer,* and the publication of the book by the Orange Judd Publishing Company should serve to direct attention of American dog lovers to this rather generally neglected breed. The price is $3.50.

Bees and Hurricanes

With the great loss of lives and property through such a tragic hurricane as that in New England last fall, the tendency is to ignore many of the minor effects. We got to wondering how bees survived such an experience and so wrote to Allen Latham, Connecticut bee-keeper who had the misfortune to live in the path of the gale. Although his crop was ruined and the bees much upset, he tells us that he lost very few bees.

"In the early stages of the storm," Mr. Latham writes, "the bees refrained from leaving their hives and thus, unless the hives themselves were disrupted by the wind, little harm resulted.

"Out of some 380 hives I lost three by drowning, and had one hundred or so overturned by the high wind. These hives were of such a construction that they did not fall apart when overturned, and also they had fixed-frames.

"Hives of the common factory type, with loose bottoms, loose bodies and loose covers naturally fell apart when overturned. If in an unsheltered spot, these hives rolled about and spilled their insides, leaving the bees exposed to the rain and the full blast of the wind. In such cases the loss was rather bad.

"Bees, however, instinctively cling tenaciously when exposed to wind, and in many cases the beekeeper was able to reassemble the parts of the hives and save many of the bees still clinging to the combs. Occasionally a queen was lost, and in all cases more or less brood was destroyed, so of course, there was a marked loss in the population of the disrupted colonies.

"In many instances big trees fell upon hives and damaged them slightly, but the loss from this cause was low. It meant some trying labor to remove those trees and get the hives back into position and condition.

"In the southeastern part of Connecticut the worst loss to the bees was the blasting of the fall bloom by the salt spray, driven fifty miles inland. The storm occurred in the height of the goldenrod bloom, and beekeepers were counting on this bloom to furnish the bees honey for their winter use. No honey of any account was gathered after the storm, 99 percent of the bloom having been destroyed."

Book List

The Palisade Press, 280 Broadway, New York City, has issued a new folder listing and describing the bird and Nature books it has published.

Another Herpetologist

Allyn L. Wood, 2502 North Alabama Street, Indianapolis, Indiana, is the latest addition to the list of young men interested in herpetology and desirous of corresponding and exchanging with others having a similar interest.

THE SCHOOL PAGE

(Continued from page 470)

17. Brass-yellow in color. *Chalcopyrite.*
Reddish brown to black making cherry-red streak on porcelain. *Hematite.*

18. Crystals in cubes. *Fluorite.*
Crystals not in cubes; very heavy. *Barite.*

19. May be scratched with glass. (Softer than 6.) Read 20.
Cannot be scratched with glass. Read 21.

20. Crystalline. Black or greenish. *Hornblende,* an *Amphibole.*
Not crystalline; colorless, white or showing a play of color. *Opal.*

21. With a metallic luster. Read 22.
Without a metallic luster. Read 23.

22. Black; heavy; magnetic. *Magnetite.*
Not black; pale brass color. *Pyrites* (fool's gold).

23. Breaks to show definite plane surfaces. *Feldspar.* Read 24.
Does not break to show definite plane surfaces. Read 25.

24. Cleavage surface with cross lines (striations). *Plagioclase Feldspar.*
Cleavage surface without cross lines. *Orthoclase Feldspar.*

25. Glassy; shows rounded or conchoidal fractures; variously colored.
Quartz. If colorless, *Quartz Rock Crystal.* If purple, *Amethyst.* If rose or pink, *Rose Quartz.* If brownish or black, *Smoky Quartz.* If in variegated bands, *Agate.* If opaque red, *Jasper.* If dull and dark, *Flint.*
Without conchoidal fracture. Read 26.

26. Soluble in hydrochloric acid; olive to gray green. *Olivine.*
Not soluble in hydrochloric acid; red, brown, yellow, green or black. *(Garnet.)*

THE LITTLE BROWN FAMILY

by Mabel E. Pattee

I first met little Mr. Brown on a cold morning in April, after a heavy fall of late spring snow. The ground was covered until not a bare spot remained, and a disconsolate chirp from the festooned currant bushes gave notice of a song sparrow in dire need.

A spot was soon swept bare near the garage, and a tempting array of food was spread out. Anything eatable was accepted at first, but soon Mr. Brown chose a little pile of chicken mash as his favorite, and until long after the snow had melted and other supplies were handy he continued to return, and, with queer scratching hops, seek out the bits of mash in the sprouting grass.

Some weeks later, while cleaning the yard, I thought it looked as if some bird was using a small red cedar tree close to the porch for a night's lodging place. So I watched from the window that evening, and just at dusk came a whisking shadow. Across the porch steps and into the dark shelter of the cedar scuttled little Mr. Brown and settled down for the night.

Every evening he sought safety in the little tree, and one day, parting the branches, I found a tiny, flat platform built of twigs laid across the branches close against the trunk of the tree. Using opera glasses from inside the window, toward night, I could see him resting secure on the neat little floor. And what was my amusement one rainy night to see him settle underneath his platform, letting it serve as an umbrella over his sleek little back.

Then came the night when not one, but two small shadows melted into the branches. Mrs. Brown had arrived!

For a time I ceased to watch them, but one day I caught a glimpse of one trailing along a wisp of dead grass, and supposed they were building on the ground. One fair and warm Sunday morning, to my astonishment, I found in a rose bush climbing on the porch, opposite the cedar tree and about six feet from the ground, a snug and complete little nest and from the inside peeped the bright, beady eyes of Mrs. Brown. The first time I ever knew a song-sparrow to build off the ground!

I tacked a piece of window shade inside on the porch screen to shield her from alarm from people and cats and soon there were five blue-white eggs spotted with brown. Then the little lady began her task of brooding her treasures and we could look over the shade-top without frightening her in the least. Mr. Brown faded out, seemingly, for a while, except that he mounted to the telephone wires at dawn and poured out a lovely, silvery serenade to tell Mrs. Brown that it was another day, and all was well.

Just twelve days after she began her vigil Mrs. Brown slipped off her nest one morning to reveal five wriggling atoms, topped with a bit of fuzz cuddled in the pretty cup. Mr. Brown reappeared like magic, and there were busy days of hunting and worm-carrying to feed the ever-hungry babies.

One day a wild shriek of fear from the parents brought me running to see the old cat clinging to the screen, her head bumping the frail nest. Quiet was restored and a piece of chicken wire fenced off the space from porch post to house corner, and the cat was kept inside the house at night.

One chilly evening I stepped out on the porch and accidentally struck the screen; to my consternation, off flew Mrs. Brown. I retreated hastily and waited anxiously for her return. Just as darkness fell she managed to flutter into the bush to make her way slowly from twig to twig, nearer and nearer, till she slipped over the brim of the nest to hover the blanketless babies. If her relief was as great as mine, I am sure we both slept the sweeter.

Came a lovely morning just twelve days after the first egg hatched, when, looking over the shade first thing as always, I found the nest empty and but one baby in sight, fully-feathered, balancing uncertainly on a twig and chirping lustily for his parents who were hysterically trying to follow the other four fledglings who were fluttering in four different directions.

There followed a few hectic days when we rescued them from perils, and kept the cats in durance, until the little wings grew more sure and the chirping voices sounded fainter as they drifted farther across the field toward the creek.

Lonely, the little nest swings as the summer breeze rocks the rose trellis, and a dead leaf in the empty cup that yet brims over with fond memories of the little brown birds' friendly confidence.

Owl Patrols Highway

Patrolling a highway alone is a lonely job at night, but Officer Ronald Faulkinham of Liberty, Maine, has a night-loving companion on his safety vigil. It is a great horned owl captured by a friend of the officer when he felled a tree in which the owl had a nest. The bird was stunned when it came down with the tree. Accepted into the Faulkinham family, the owl seems content with life with man, a contentment partly due to a regular diet of raw beef. The bird rides with the officer, is not restrained, and when not on duty is likely to go foraging into the night, returning home in the morning.

Reelfoot Report

Much material of interest to students of aquatic life is to be found in Volume III, January, 1939, of the report of the Reelfoot Lake Biological Station, Tennessee. One feature is a description of additional fishes found in the lake, together with a key to all the Reelfoot fishes, both reports being made by Dr. Clinton L. Baker, director of the station. Another interesting article, with illustrations, is that on the amphibians and reptiles of the lake and its vicinity by Malcolm V. Parker; and bird students will find Eva O. Gersbacher's discussion on the heronries of Reelfoot Lake of special interest. The report is published by the Tennessee Academy of Science, Nashville, Tennessee.

Starlings in Montana

After reading our suggestion that the starling be allowed at least to take out first citizenship papers, Louis Wessel of Great Falls, Montana, took his pen in hand to advise us that the starlings have taken up residence in his community and at Poplar, Montana, some 300 miles east. Mr. Wessel suggests that the birds may have made their way up the Missouri River by easy stages.

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UNDER THE MICROSCOPE

by

Julian D. Corrington

The Iron Hæmatoxylin Technique

In connection with the article on preparing stained mounts of desmids, in the June-July 1939 issue, the following technique notes were deferred through lack of space.

The most famous of all biological dyes is Haidenhain's Iron-Alum Hæmatoxylin, introduced by Benda in 1885-86 and by Haidenhain in 1892, and still retaining first place as a specific stain for chromosomes during mitosis, for the chromatin and nucleoli of resting nuclei, for striated muscle fibers and still other subjects, including such algae as desmids.

This stain is employed by the regressive method—that is, material is purposely overstained, then is destained (differentiated) to just the right amount of intensity before the bleaching action is checked. Two solutions are used and they may be kept in staining jars and used many times on different materials before they are at last worn out and have to be thrown away. Number one is a four percent aqueous solution of ferric alum (ammonio-ferric sulphate), while number two is a one-half percent solution of hæmatoxylin in distilled water.

These are best purchased ready for use, but if one prefers to make as many of his own reagents as possible, number two may be prepared as follows: dissolve the hæmatoxylin crystals in the distilled water and let stand for 10 days in a bottle closed with a plug of cotton. This is to facilitate ripening of the solution, which takes place by oxidation. Shake the bottle frequently and vigorously during this period. Let stand without shaking for a month longer or until a deep wine red color results, then store in a dark-colored bottle with a tight cork or, preferably, a glass-stoppered bottle. Keep in a cool and dark situation when not in use.

Desmids can be stained by decanting the last washing water from the vial of fixed concentrate and replacing for 3 hours with solution one, the ferric alum. This reagent acts here as a *mordant;* it does not impart a stain itself but prepares the material to receive the stain, which is the second solution, hæmatoxylin. After the mordant is carefully poured off and saved, replace with several changes of water over a 5-minute period, shaking the vial frequently. Then add the hæmatoxylin and allow to act for 24 hours, followed again by washing in several changes of water for 5 minutes or until the water ceases to show any color.

The desmids have been overstained and are now placed in the ferric alum again, the reagent this time acting to differentiate. No definite time of immersion can be stated, each operation in iron hæmatoxylin staining having to be determined for itself by inspection under the microscope. After half an hour, remove a very small drop containing the algae to a slide, add water and a cover glass, and examine under first low and then high power. Repeat this examination, as may be necessary, at 10-minute intervals, until inspection shows the material to be correctly stained as to intensity of the dye in the nuclei and pyrenoids, the stained structures standing out in sharp black-and-white contrast to the unstained portions. Fine detail should be brought out with great precision. When this time arrives, check the action of the ferric alum by washing in several changes of water over a half-hour period, then dehydrate through the alcohol series and clear in xylol, 5 minutes duration for each, finally mounting in balsam.

Another method is to apply a very thin film of Mayer's albumen fixative (March issue) to a clean slide, put on a drop of desmid concentrate, which has been fixed and washed, and allow to become nearly but not completely dry. When all excess water has evaporated but while the smear is still well moist, immerse the slide in a jar of ferric alum and continue as before, carrying the material through on the slide instead of in a vial, and shortening all times by one-half. If only a single slide is desired, this method is to be preferred.

Sectioned materials, as plant root-tips for mitosis or tongue for striated muscle are carried through this technique on slides in this same manner; about 30 minutes in solution one, 1 hour in number two. Control of differentiation is accomplished by removing slides from their second bath in ferric alum, rinsing for a moment in water, then mounting the slide for examination under the microscope, without using a cover glass, taking care to keep the section wet with water during the inspection. One soon learns to do this rapidly. Stop the action by transferring slides to water as soon as the staining is correct.

* * *

News and Notes

The New York Microscopical Society held its Sixty-second Annual Exhibition at the American Museum of Natural History in New York City on February 25, 1939. There were fourteen tables on which sixty-two individuals and two societies displayed well over one hundred slides, instruments and photographs. The President for this year is H. W. Zieler.

* * *

In the British publication *Photography* for April, 1939, appeared a two-page article that will interest all photomicrographic enthusiasts. *Pocket-Lens Photography,* by Dr. James Small, describes methods and includes four beautiful illustrations of a system of making photomicrographs through hand lenses of 1, 2, and 3 inch focal lengths. The field of view covered ranges, with these lenses, from ⅜ to 1½″, magnifications varying according to degree of photographic enlargement. One British firm expects to place a commercial outfit of this nature on the market and has promised to notify us when ready, so we may pass on the word to you.

* * *

On April 20, Bausch & Lomb opened its Hall of Optical Science in the Museum of Science and Industry, R. C. A. Bldg., Radio City, New York, with distinguished guests from the fields of science, industry and government attending a luncheon given by company officials to celebrate the progress of science and to mark some of the particular contributions of optics.

In this Hall the dry laws of optics are transformed into dynamic displays of light, motion and color, making it easy for the observer to understand many of the principles that guide the lens designer and optical engineer in the construction of optical instruments. By merely pushing buttons and turning knobs visitors may see how different surfaces reflect, refract or disperse light. Sectional views of such instruments as binoculars and microscopes show mechanical features and the pathway of light rays.

There are dioramas, batteries of automatic projectors, revolving illusions and ten demonstration lectures daily, telling stories of manufacture or historical development. It is estimated that more than a million visitors to the New York World's Fair will visit the Hall of Optical Science during the year it is

GEORGE F. MEARS AND CARL WALTHER WITH A REPLICA OF THE FAMOUS HOOKE MICROSCOPE OF 1665, ONE OF SEVERAL MODELS IN THE HALL OF OPTICAL SCIENCE scheduled for operation. If you will be in New York this year, do not fail to see this marvelous and highly informational exhibit.

* * *

A notable experiment in science education is scheduled to get under way in July of this year, backed by a Carnegie grant and supported by an array of America's leading scientists from many fields. Philadelphia has been selected for the first test of this unique plan, but knowledge gained there will later be applied all over the country.

All museums, research and educational institutions, scientists and clubs in the Quaker City will be organized, and the greatest science educators in the country will be brought there for special lectures, the object being to bring science to the masses. The first period of discussions has as its subject "Science in Our Lives", while more advanced work will be offered in the fall. The plan is to have professionals work with, advise and consult with amateurs, and also to enlist the aid of amateurs in coöperating with research men. Microscopy is included among many other sciences. A monthly news letter of amateur science will be circulated. Dr. Edwin Grant Conklin, of Princeton, is chairman of the committee in charge.

* * *

Announcement has been made of the A. Cressy Morrison Prizes for 1939, consisting of two prizes of $200 each. All members of the New York Academy of Sciences or any of its affiliated societies are eligible to compete by submitting papers on science subjects. For detailed information address Frederick H. Pough, Secretary, The New York Academy of Sciences, Central Park West at 79th St., New York City.

* * *

A Handy Hot Plate

The following ingenious gadget for the microscopist has been contributed by Garry Weingarten, chemist at the Southern Laboratories, Huntington, W. Va. It often happens that electricity but no gas is available and the microscopist wishes something better as a burner than the relatively feeble alcohol lamp. For these and other circumstances, a serviceable hot plate can easily be made from a household cigarette lighter, plugged into the house current.

The most convenient type of lighter to secure is the one resembling a fuse and that can be screwed into a porcelain cleat receptacle. Some turn on and off by a switch and need no alteration. If only the kind that must be tilted to make contact is available, remove the brass collar and interior brass ball, substituting for the latter enough copper or brass discs to insure permanent contact, then operate by screwing and unscrewing into the receptacle, or introduce a snap switch.

If a second lighter is placed in series with the one to be used as a burner, the mechanically-inclined operator can so fix the second one as to control the amount of current to the burner and thus control its heating capacity. Or rig up a small ring stand with a clamped ring whose elevation above the burner can be altered, so that a slide or beaker can be brought closer to or farther away from the heat, as desired.

Mr. Weingarten writes that he has used such a device to evaporate drops on slides, evaporate solutions to dryness, and practically all other operations of the professional hot plate save fusions. He also finds there is a lessening of the danger of inflammability when volatile liquids are used with this hot plate rather than over an open flame.

* * *

Trade Notes

Allow us to introduce you this month to another British firm, Messrs. Flatters & Garnett, Ltd., 309, Oxford Road, Manchester, 13, England. They make microscopes and many other instruments, accessories and specialties, and carry a huge stock of biological preparations, slides and reagents—probably the largest listing of prepared slides in the world. Their American agent is the Arthur H. Thomas Company, West Washington Square, Philadelphia. Flatters & Garnett are the manufacturers of Euparal and a new Neutral Synthetic Mountant.

We have a supply of their Catalog H3 for distribution and you may obtain a copy by writing Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St. N.W., Washington, D. C., and enclosing a three-cent stamp.

* * *

Everyone interested in entomology will want a copy of *How to Know the Insects,* by H. E. Jaques, 709 N. Main, Mt. Pleasant, Iowa. Order from the author; spiral wire binding, $1.00; cloth, $1.80, postpaid. Within the 140 pages will be found a mine of condensed information on collecting and mounting, illustrated keys, references, hints to the teacher, the student or the collector, and lists of orders and families. The author writes with charm and authority and occasionally enlivens his material with an amusing cartoon in the modern style. We recommend this work highly, as we did his *Living Things, How to Know Them,* reviewed in the May, 1939, issue.

* * *

One of the best small books on technique we have seen is *Microscopic Objects—How to Mount Them,* by Jean C. Johnson; pages viii, 144; several zinc illustrations and a number of plates of good photomicrographs. The 14 chapters take up materials, formulæ and tables, and the preparation and mounting of insects, diatoms, crystals, rock and mineral sections, opaque objects, and the more usual biological sections and smears, along with many miscellaneous items. Our only criticism is that the index is far too brief and inadequate. Suited for both beginner and advanced student. Order from W. Watson & Sons, Ltd., 313, High Holborn, London, W. C. 1, England; 3/6.

* * *

Under the Microscope is a department of NATURE MAGAZINE designed for those readers interested in microscopy and maintains a service to render assistance with problems in this field. You are invited to take advantage of this service. Address all inquiries to Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St. N.W., Washington, D. C.

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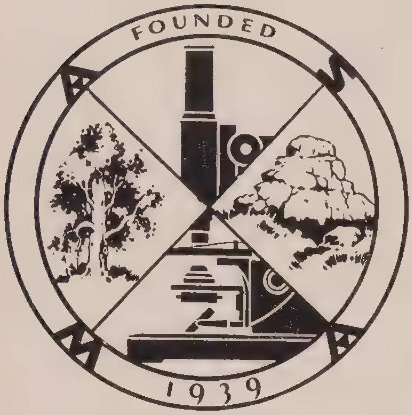
Official organ, *Nature Magazine*, Washington, D. C.

Address all communications concerning the Society to Dr. Corrington at Chestertown, Md. Application for Membership form sent on request. Dues, one year, fifty cents; two years, one dollar. Nature and purpose of organization explained in October, 1938; installation announced in March, 1939, issue of *Nature Magazine*.



Our New Emblem

Well, Microfans, here it is—the newly-selected insignia of the newly-formed Society, and right proud we are of it, to be sure. It is most appropriate, and, to our way of thinking, one of the most beautiful devices of this nature we have ever seen. Dominated by a central microscope in silhouette, the left quadrant shows a tree to represent organic microscopy, while the right one has a large rock mass to symbolize the inorganic field. In the outer ring are the initial letters ASAM and the date of founding.

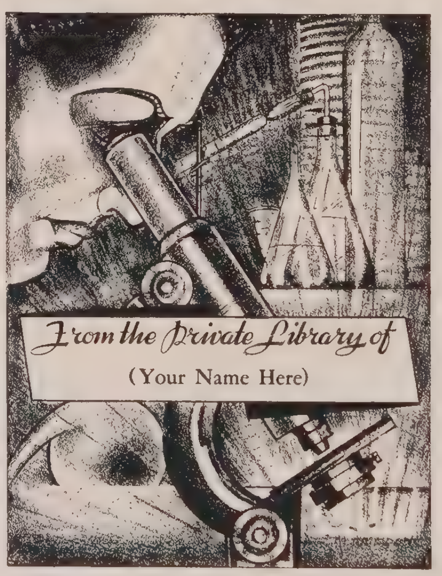
We wish you could all see the original drawing, twice the size of the copy here shown. It is superbly executed, the work of a professional artist who is one of our members, Mr. Herbert Meyer, of 1437 East 12th St., Brooklyn, New York. Ideas from which this emblem was selected came from several sources, as we had anticipated, Mr. Meyer and your Secretary contributing, but chief credit goes to John J. Ingalls, San Diego, California, who submitted three very fine insignia, one of which incorporated the central theme of a microscope flanked by two quadrants. Mr. Ingalls had a landscape with tree at the left and a factory at the right. Mr. Meyer tried a cross section of a tree in the left quadrant, a rock section in the right, then threw the drawing into the waste basket because, as he writes, "unless I told you what they were you couldn't even guess." Then he tried diatoms and other time-honored objects, finally deciding on the more simplified designs now adopted, since the finished emblem had to be artistically balanced and tied together, representative of the subject, clear to anyone, able to stand considerable reduction without loss of definition, and suitable for certificates, publication, letterheads or pins.

Our thanks to these gentlemen and to J. P. Gaehl, Standish, Michigan, and George Fox, Brooklyn, New York, who also submitted most attractive designs involving considerable labor.

We asked Mr. Meyer, who contributed the finished drawing without charge to the Society, to tell us something about himself and he replied that at one time he was art director for one of the largest film concerns in the East, but is now free-lancing in such diversified fields as box designing, magazine, newspaper, car cards and motion picture advertising. As a microscopist he has studied fungus growths on fishes and done some research with mites on reptiles. His aim in joining the Society was to find someone with whom he could work out problems.

Mr. Meyer was a member of the Greater Aquarium Society of Brooklyn and has won many awards in breeding and raising rare tropical fish, of which he has had as many as 3000 at one time. He sent us a number of very fine and most interesting photos of his collection of live reptiles and amphibia, his chief present hobby, including an engaging pose of the rare *Hyla andersonii* on a wine glass; snakes of many species, notably a large boa; alligators, turtles and lizards in great profusion. He also specializes in raising rare plants. No wonder that classes from a nearby school "visit my home in shifts of thirty at a time."

How About a Bookplate?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Shown herewith is a bookplate that will appeal to all microscopists and provide them with a most attractive and professional-looking embellishment for their private collection of books. It is executed in rich sepia brown on heavy gummed stock, and comes with your own name printed in, all ready to moisten and put right in your books, identifying them with an exclusive label symbolizing the endless research of the scientific field and the part that research has played in world progress.

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So that the Society can participate, th Secretary has agreed to handle all orders an send them to the publishers in bulk lots which will be returned to him for distribution to purchasers. This will involve a sligh delay while orders are accumulating, bu nothing serious. Send check or money orde with your order to Julian D. Corrington, 11 Water St., Chestertown, Maryland. No ac knowledgments will be made, since thi would mean more work and postage, but i is not anticipated that any difficulties wil arise.

* * *

Among recent members are some who hav established reputations in microscopy. W. E Watson-Baker, Managing Director of W Watson & Sons, Ltd., famous manufacturer of microscopes and optical equipment, London, England, is a Fellow of the Roya Microscopical Society and the Linnæan Society, President of the Quekett Microscopica Club and member of many other scientifi societies in England and on the Continent

Mr. Charles S. Foster is photomicrographe with the Eastman Kodak Company, Rochester New York, and writes that he is enthusiasti about the ASAM, and whenever we need an help, "just holler."

The June, 1939, issue of *The Microscop and Entomological Monthly,* British publication previously reviewed in these columns contains a very fine illustrated article b ASAM member William Byford, Toronto Canada, on a new design for a homemad microscope lamp. For low powers and routin uses an ordinary 40-watt opal bulb is employed, while for high power and photomicrography an exciting lamp as used i sound motion picture projection provides a intense light source.

Amateurs of every stage, from rank beginners to those as advanced as any professional, cannot help deriving benefit from association in the same Society with men o the caliber of these and others to be mentioned in later issues. We can write the of special problems in their particular fields ask for criticisms of our work, and fro time to time they will doubtless contribut to our Bulletin or serve as officers.

* * *

Speaking of the Bulletin—as we write this under the waving palms of Miami, within sight of beautiful Biscayne Bay—the first number of the Bulletin is being mimeographed up there in Elkins, West Virginia, by member Boyers M. Clark, while across from him in Aberdeen, Maryland, member William Cronin is engaged in the perspiring task of hand-lettering the new Certificates of Membership. It's a job, folks, directing all this business by long distance, but in these cool tropical breezes, our sympathies must go to those mentioned above who are in the sweltering and torrid north.

* * *

The largest cells ever produced on earth are extinct. They were the yolks of dinosaur eggs, some of them as large as a man's head in all probability. The largest living cell is the ostrich egg yolk—nearly the size of a baseball.

Teaching Tolerance

The November issue of *The Teaching Biologist* is devoted to the scientific and educational aspects of anthropology. Dr. Franz Boas, dean of American anthropologists, and Dr. H. L. Shapiro, associate physical anthropologist of the American Museum of Natural History, as well as a group of high school biology teachers, have prepared articles for this issue. The entire magazine will deal with the problem of race and show how biology can promote tolerance. It will contain an outline of a teaching unit on mankind, and will suggest socially significant subject matter, activities, methodology, testing procedure and bibliography. The edition will be limited, so those interested are urged to get in touch with William Shulman, business manager for the New York Association of Biology Teachers, 60 Clarkson Avenue, Brooklyn, New York. Single copies of the magazine sell for twenty-five cents.

Squirrel, Mouse and Company

In *The Chisel-tooth Tribe*, Wilfred S. Bronsen has given us a treatment of this interesting group that seems to be the best we have seen. It starts out with some general characteristics, has chapters on tree squirrels and ground squirrels, goes on to prairie dogs and beavers, and when we have pranced through the delightful accounts of the rodents belonging to several other groups we find that we have learned most of the more interesting facts about the more notable gnawers of the four or more corners of the earth.

To one who has read so many pages about the many kinds of rodents that have been measured and classified and named in this and other countries, and how many millions' worth of grain and other food stuffs they eat, and how many tons of poison it takes each year to keep them from eating us out of house and home, and what a debt we owe to those wise people who thus save our lives, it has been a keen pleasure to read this delightful book, in which none of these features are elaborated. In its 200 pages we learn painlessly of the home life of our little wild neighbors. A careful reading should convince anyone that all the chisel-toothed clan are a part of Nature's plan to populate the earth, part of a great interlocking system in which all benefit each other in some degree. Even we ourselves are a part of it, for rabbits have become an important part of our food, even in the present stage of our civilization, just as they were in the days of early man.

The Chisel-tooth Tribe is published by Harcourt, Brace and Company at $2.00. E. A. P.

Texas Ferns

Those interested in ferns will enjoy an attractive little booklet by Elsie McElroy Slater entitled *Thirteen Ferns of The Mexican Border*. The immediate region concerned is the vicinity of El Paso, Texas. After an interesting introduction, the author gives an equally interesting and careful discussion of this baker's dozen ferns. Drawings supplement the text. This little fifty-six page, paper-bound booklet is available from the author at 516 Prospect Avenue, El Paso, Texas, for seventy-five cents.

Idaho Mammals

The latest addition to state lists of mammals of our Northwest is *The Recent Mammals of Idaho* by William B. Davis of the Museum of Vertebrate Zoology at Berkeley, California.

Idaho's extensive range in altitude, temperature and humidity, affords a great variety of habitat types, and one hundred and forty-one forms of mammals have been detected within its borders. Of these all but a few species are still reasonably common; a few of the larger and more valuable species have been reduced dangerously, or perhaps entirely extirpated. All species are treated in more or less detail in this book of four hundred pages.

The entire work shows scholarship of a high class. The geology, geography, floral areas, and climate, the interesting effects of which permit the existence of so rich a fauna, and provide the factors that determine their distribution, are treated in a logical and masterly manner. If one misses some of the wealth of detail on seasonal habits that marks certain state lists, he is repaid by the fuller discussion of distributional areas, the detailed account of type localities (with map), and the gazetteer of localities. Forty-three forms have been described from localities within the state, three of which date from the present volume. There is an extensive list of literature cited, and a good index.

To the Caxton Printers of Caldwell, Idaho, are due the thanks of all interested students of mammalogy for undertaking and carrying out so ably the task of printing a book that involves so much attention to detail as a list of this character. Teachers of biology, foresters, game officials, sportsmen and students of natural history generally, not only in Idaho but in neighboring states, will find the work invaluable. It may be obtained from the publishers for $5.00, a price that we fear involves a loss to its makers. E. A. P.

Forestry

An Introduction to American Forestry by Shirley W. Allen of the School of Forestry and Conservation of the University of Michigan is a general text for the beginning students of forestry. It is a book that will, of course, be valuable in forestry schools, and also should be found in the libraries of C.C.C. camps. It is published by McGraw-Hill and sells for $3.50.

A New Edition

First published in 1929, *Botany*, by William J. Robins and Harold W. Rickett, was brought out in a second edition in 1934 and now appears in a third edition. This is, of course, a splendid botany text for college and university students, brought up to the minute in the present volume and continuing the general rearrangement of treatment inaugurated in the second edition. Published by D. Van Nostrand Company, the book lists at $3.75.

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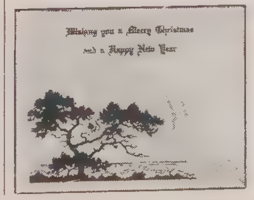

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BY NORRIS W. HARKNESS

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Each month during the coming year the makers of the two best pictures selected by the conductor of this department and two other judges will receive their choice of one of the latest photographic books, and their winning pictures will be reproduced in Nature Magazine. At the end of the year, one picture—selected from among the monthly winners—will receive a grand prize of a $25 merchandise award. The list of books from which the winners' selections may be made will be published in the December issue, and the winners among entries received before the fifteenth of any month will be announced in the issue of the second month after that date. Entries received after the fifteenth will be held for the following month.

Any amateur photographer may enter as many pictures as desired, and they may be either contact prints or enlargements, but not larger than eight by ten inches. They should be unmounted. The only requirement is that every entry must have the photographer's name plainly written or stamped on the back of the print. Prints cannot be returned, and we cannot enter into correspondence with regard to individual prints.

Prints will be judged equally for their pictorial value and Nature interest.

Send entries to Norris W. Harkness, 320 East 42nd Street, New York City.

A STUDY OF A COMMON TERN'S NEST THAT MAKES A FINE PICTURE AS WELL. BY F. SEYMOUR HERSEY, EXHIBITED AT THE ZEISS ANNUAL EXHIBITION

A Suggestion

A year or two ago we began a series of pictures that is giving us a most useful exercise of skill and imagination, and that will—we hope—result some day in a really worthwhile story. We began it in black and white, but have now supplemented those shots with color, and the progress is satisfying and pleasant. It is the story of a full year in a small garden, with a complete history of each month's activity from the spring preparation of the ground and the planting of the annuals, through the growing and harvest seasons and the sleep of winter, to the melting of the last snow and the return of the birds. Our pictures are concerned not only with the plants and flowers, but also with the birds and the small mammals, and even with the destructive insects, which seem more popular with us than with the owner of the garden. We have made shots from the same spot in early morning, high noon, and with the last light of sunset, and in every month of the year, in an attempt at a sort of overall index to the more detailed life of smaller parts, and we have followed one particular flower from its first breaking through the ground to the fall of its last seed. Only a few of the original pictures remain in the collection, for most of them have been replaced by later and more successful efforts, and it is this that sometimes makes us wonder if it will ever be really finished. But if it isn't, it won't matter. The pictures themselves and the story they tell would be worth the effort even if their making had not in itself been real fun.

This idea of a series of pictures to tell a whole story clearly and in perfect detail can be applied to innumerable phases of Nature photography. We might do the "Life of a Frog", or of any other familiar friend, or of a favorite flower or plant. It doesn't matter that it has been done before or that some one else is working on the same subject. Our viewpoint and opportunities will differ from theirs, and it is probable that our whole approach will vary so much from that of our competitor that our results can scarcely be thought to conflict. He makes all his shots indoors, or strives only for strict naturalist's accuracy, while we shoot some of ours in the field and try to make each one a combination that will appeal to both the botanist or biologist and the pictorialist. He may show his series as a book full of prints, while we do ours as slides and project them on a screen. Truly, here is a project that we can make entirely our own by the exercise of all the imagination and artistry we possess, and we can go back and make retakes until we have each shot just as it ought to be.

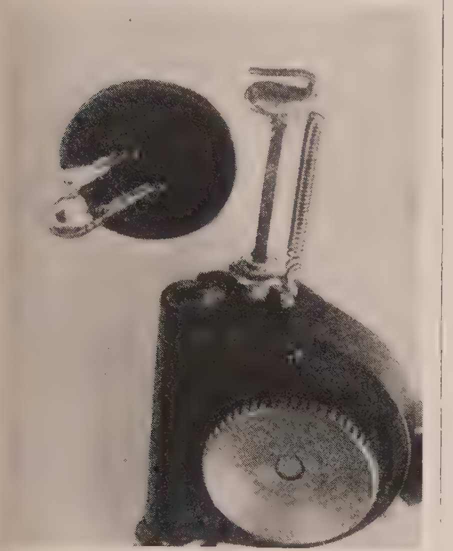
There are several things we ought to keep in mind as we select our subject. It should be near our headquarters so that we can make frequent visits to it. If possible, we should choose something that can be shot in various stages of its life on the same day by using, for example, both eggs and tadpoles and even frogs as models on the same trip. We should be able to include enough of our subject's surroundings to give a true setting to our picture, and yet most of our shots will probably need to be close-ups that will omit no details. And, most important, we should work with a definite plan but one that is sufficiently flexible to permit of changes when they are warranted, and then do every step of the process to the best of our ability. Both the doing and the results will be valued and valuable.

If any of our readers have made such series

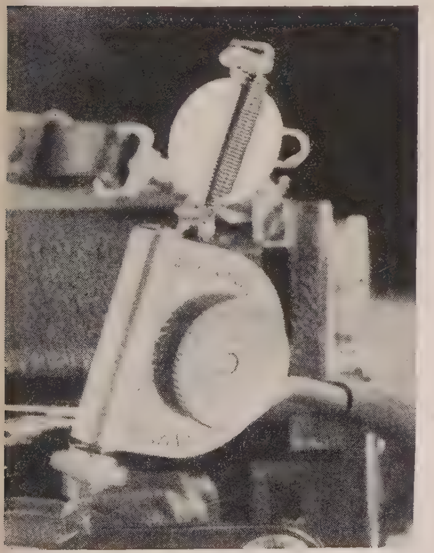
—or do make them in the future—we would enjoy hearing about the procedure and the results.

Remote Control

Often the location of the den or nest makes it impossible for us to hide near enough to make our picture of the owner when he returns, and, indeed, our presence will usually keep him away from home. To get the natural kind of shot we want, then, it becomes necessary for us to arrange some sort of device with which we can stay far enough from the spot to keep from frightening our subject and yet be able to fire the camera at the right time and get a close-up of him.



A sufficiently long cable release is out of the question for most of us and, to the best of our knowledge, there is no other firing device available on the market. So we make our own. As shown in the accompanying picture, it consists of one of the small plunger releases that can be bought for a dime in the photographic stores, a spring to force the plunger into the cable release socket in the shutter, and a disc to hold the plunger out until we are ready to make the shot. We soldered short lengths of copper wire to the end of the plunger and to the base of the release (the part that screws into the shutter) and used the wire to hold the spring, which



(Continued on page 536)

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Devoted to the Practical Conservation of the Great Natural Resources of America

IN THIS ISSUE

Cover Design . . . . Rosalie Rees
Camera Trails . . . . Norris W. Harkness 482
Indoors and Out . . . . Howard Zahniser 487
Feathered Jackasses . . . Eleanor Elliott Ullmann 489
Your Winter Window Garden . . Adolph Kruhm 493
Tree Sketching as a Hobby . . . . Charles D. Utt 496
When Nature Goes to Sea
Maud MacDonald Hutcheson 497
Afraid to Go Home in the Dark
Stephen Haweis 499
Breadfruit Tree Stamps . . . . Edith M. Laing 500
Furs under the Microscope
Leon Augustus Hausman 501
Autumn's Farewell (Poem)
Rebekah T. Fleischmann 503
Pymatuning Museum . . . . N. R. Casillo 503
Petrified Corals and Sponges . . . C. S. Gwynne 504
A Skunk Half-Dozen . . . . Mary Drake 505
The Northern Shrike . . . . Hugh M. Halliday 507
An Intimate Look at the House Fly
C. H. Brown 508
Conservation Education in the Schools
E. Laurence Palmer 509-516
Isles of Sandstone Trees
Lewis and Marian Walker 518
Editorials 521
Things to Think About 522
Unique Nature Exhibit 523
It's Done with Mirrors . . . . Tony Lascelles 524
On Tap! . . . . Margaret W. White 525
A String of New Potatoes
Robert Sparks Walker 526
Indian Summer is Over (Poem) . . . . . . Jean Post 527
At Random . . . . Oscar Ostlund 527
American Eagle Revolutionists
Grace V. Sharritt 528
Like an Army with Banners (Poem)
Pauline Dillingham 529
Fish or No Fish . . . . H. P. K. Agersborg 530
November's Evening Sky . . . . . . Isabel M. Lewis 533
The School Page . . . . E. Laurence Palmer 538
Grooming Your Dog . . . . Diana Thorne 537
Under the Microscope . . . Julian D. Corrington 542

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Indoors and Out

By HOWARD ZAHNISER

Titian Ramsay Peale seems to be coming close to becoming the forgotten naturalist of the United States. Having never succeeded in writing a book widely circulated, or in becoming the subject of such a work, he apparently has shared the fate of all those who miss the perpetuating influences of the printed word. The one hundred and fortieth anniversary of his birth on the seventeenth of November seems to be a fitting occasion for a remembrance of his services to early American natural history and of the significant associations in his career.

This career began with great promise. For one thing, Titian Ramsay Peale was the son of Charles Willson Peale and the half-brother of those still-remembered namesakes of the great painters—Rembrandt, Rubens, and Raphael Peale. It was not surprising that Titian developed a talent as an illustrator. He inherited also influences that were, to say the least, kindly for one interested in natural history. Fifteen years before Titian's birth, Charles Willson Peale had started the famous museum that bore the family name—a museum that was outstanding in the world in its day as a repository of important natural-history specimens, among them those used in the description of many new forms of life by Alexander Wilson, George Ord, Charles Lucien Bonaparte, Thomas Say, and other notables. Add to these the associations with the great naturalists themselves and the concurrent opportunities for exploration, and one has what seems to be an ideal environment for a prospective naturalist.

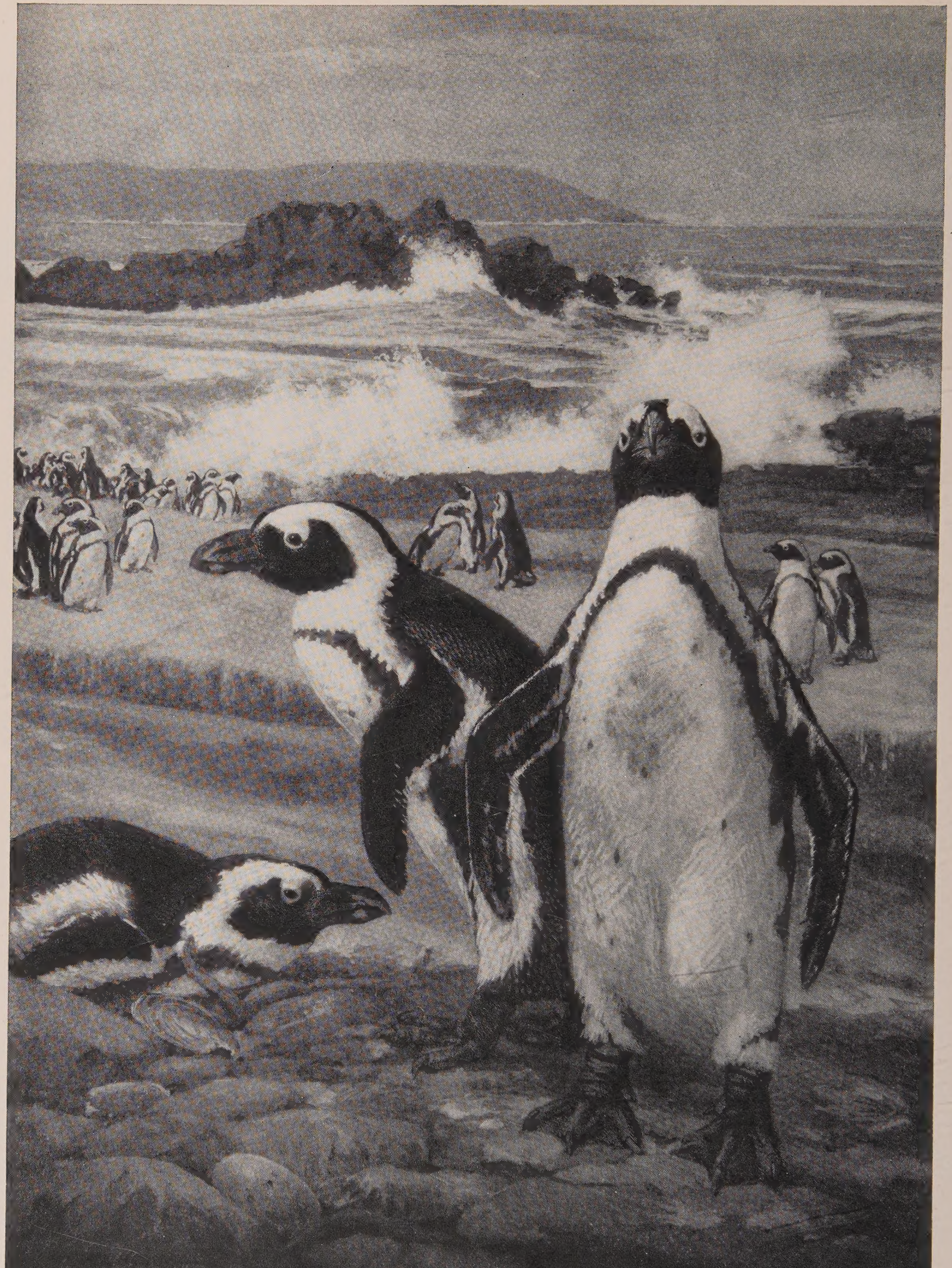
As a matter of fact, it could hardly be said that Titian Ramsay Peale failed to realize his expectations in any way but this one: He left no enduring contributions to the literature. Had he done this he would doubtless still be sharing our green laurels. Perhaps this failure is not altogether his own fault, for he seems at a critical time in his career as a naturalist to have been the victim of professional jealousy and of other circumstances beyond his control. A sketch of his biography—such as that in the *American Dictionary of Biography* or that in *Cassinia* for 1915 by Witmer Stone—is interesting not only in itself but also in connection with several significant developments—those of museums, of exploration, of illustrative art, as well as that of natural history.

When he was only 19, Titian Ramsay Peale accompanied George Ord, Thomas Say, and William Maclure on an expedition to Georgia and Florida. The next year he went as assistant naturalist on Major Stephen H. Long's expedition to the Rocky Mountains and was one of the party that first ascended Pike's Peak. Major Long's orders said that Peale's "services will be required in collecting specimens suitable to be presented, in drafting and delineating them, in preserving the skins, &c. of animals, and in sketching the stratifications of rocks, earths, &c. as presented on the declivities of precipices." He made 122 sketches, 21 of them finished and the rest in outline. Major Long in his report said that the young Peale "was active and industrious in the collection and preservation of such rare specimens of animals, &c. as came under our observation." (Major Long seems to have had a fondness for ampersands!) In 1824 Peale collected in Florida for Charles Lucien Bonaparte. In 1832 he explored in the interior of Colombia in South America. The climax of his career as an explorer came from 1838 to 1842 when he was a member of the United States Exploring Expedition under Charles Wilkes, but from the experiences that resulted from his work for this expedition came also what may have been the frustration of his career as a naturalist.

During these years already sketched Peale had also been earning a reputation as an artist. As early as 1822 he had exhibited water-colors of animals, and in 1826 he had such an exhibition at the Pennsylvania Academy of Fine Arts. He made several large oil paintings from his sketches on the Long Expedition—paintings of buffaloes, moose, and Rocky Mountain sheep. Of more importance is his work as an illustrator. He did 28 of the 54 illustrations in color for Thomas Say's famous three-volume *American Entomology* published from 1824 to 1828, and himself colored the plates in the original work. The color plates in two volumes (I and IV) of Bonaparte's *American Ornithology* were by Peale, and there were other calls for his services as an illustrator. Bonaparte said: "I have been solicitous to procure the best representations of my birds . . . A better choice could not have been made than that of Mr. Peale."

During all these years Peale was also closely associated with the family museum, later called the Philadelphia Museum. In 1833 he became the manager of the institution and its lecturer on natural history, a service that continued, with only the Exploring Expedition interruption (1838-42), until the museum's financial condition after the United States Bank failure forced its sale to P. T. Barnum and Moses Kimball, in 1846. This experience with the museum suggests a tempting digression, for Peale's Museum not only was an interesting place but also is significant in its influence on the development of the great institutions of today. For example, it was first in exhibiting specimens with a painted background of their environment—the forerunner of the habitat groups that now fairly transport one to the outdoors. But the story of the museum can better wait for another page. When it failed Titian Ramsay Peale's active associations with natural history were nearing their end.

They "might have been" just reaching their fruition. These "sad words" are suggested by the circumstances surrounding the publication of Peale's one book—circumstances viewed, however, nearly a century later by one who is unable to obtain all the facts. In 1848 Peale's *Mammalia and Ornithology* was published as Volume VIII of the reports on the Wilkes Expedition. It is remarkable now because of its rarity (there are (Continued on page 536)



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(Reproduced from a painting by R. Bruce Horsfall)